MACHINE AND TOOL ENGINEERING

The TOOL ENGINEER

JANUARY, 1944

Official Publication of American Society of Tool Engineers

w Budd Fabricates STAINLESS STEEL PAGE 65

Production Economy With Modern Methods PAGE 77

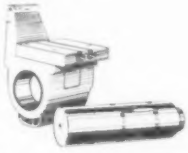
having Aircraft Gears SAVES MAN HOURS PAGE 91

Machines Will Make MORE JOBS PAGE 107

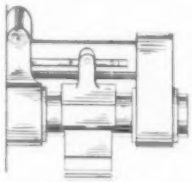
EATURES SUCH AS THESE

AUTOMATIC LIFTING AND LOCKING MECHANISMS for spindle carrier assembly eliminate wear during index and eliminate weave during the cutting cycle.

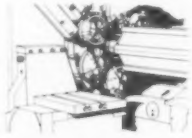
AUTOMATIC STOP stops the machine, with collet open in the loading position and all slides withdrawn, when stock is exhausted. Red light signals the operator.



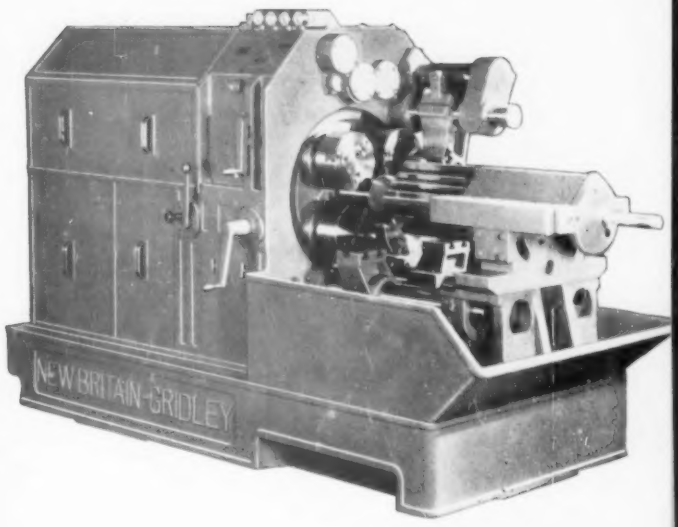
FORMING SLIDES mounted on cylindrical studs eliminate adjustment and vibration, keep grit away from vital bearing surfaces.

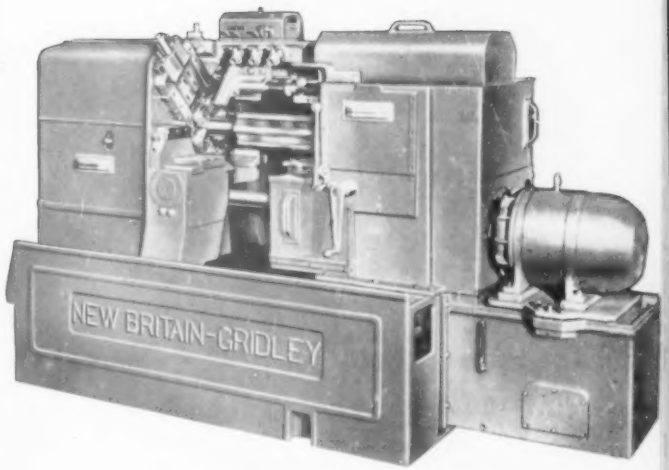


SWINGING TYPE FORMING ARMS leave no bearing surface to be affected by chips or grit on the chucking machines.



OPEN END CONSTRUCTION provides WIDE OPEN accessibility to all tools and chucks, and convenient chip removal, for all New Britain Chucking Machines.





MAKE NEW BRITAIN AUTOMATICS YOUR CHOICE FOR PRODUCTION

NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

PUBLISHED BY THE BRAMSON PUBLISHING COMPANY

INSIDE STORY

New Free Bulletin Shows You How

- GREEN operators become COMPETENT inspectors
- "Feel" errors are ELIMINATED
- ALL okay parts are passed; ALL out-tolerance parts are rejected
- Work is checked with LABORATORY precision either at the machine or in final inspection

THERE is no argument over rejected parts when P&W Electrolimit Comparators take over. You set up the required limits with master gages, and from then on the parts are either right or wrong. The gage picks up any error and magnifies it electrically up to 20,000 times. That error becomes a large needle movement across a dial . . . so easy to read that even the rawest industrial recruits have no trouble. Pratt & Whitney Electrolimit Comparators have made history in the war effort, and will do the same thing some day in the peace to come.

JUST PRINTED: the new bulletin illustrated above — "P&W Electrolimit Internal Comparators" — tells the "inside story" . . . the facts about fast precision checking of holes. A companion piece covering P&W Electrolimit *External* Comparators is also available. Either or both will be sent promptly to company executives who request it on their own letterheads.

PROMPT DELIVERY

PRATT & WHITNEY

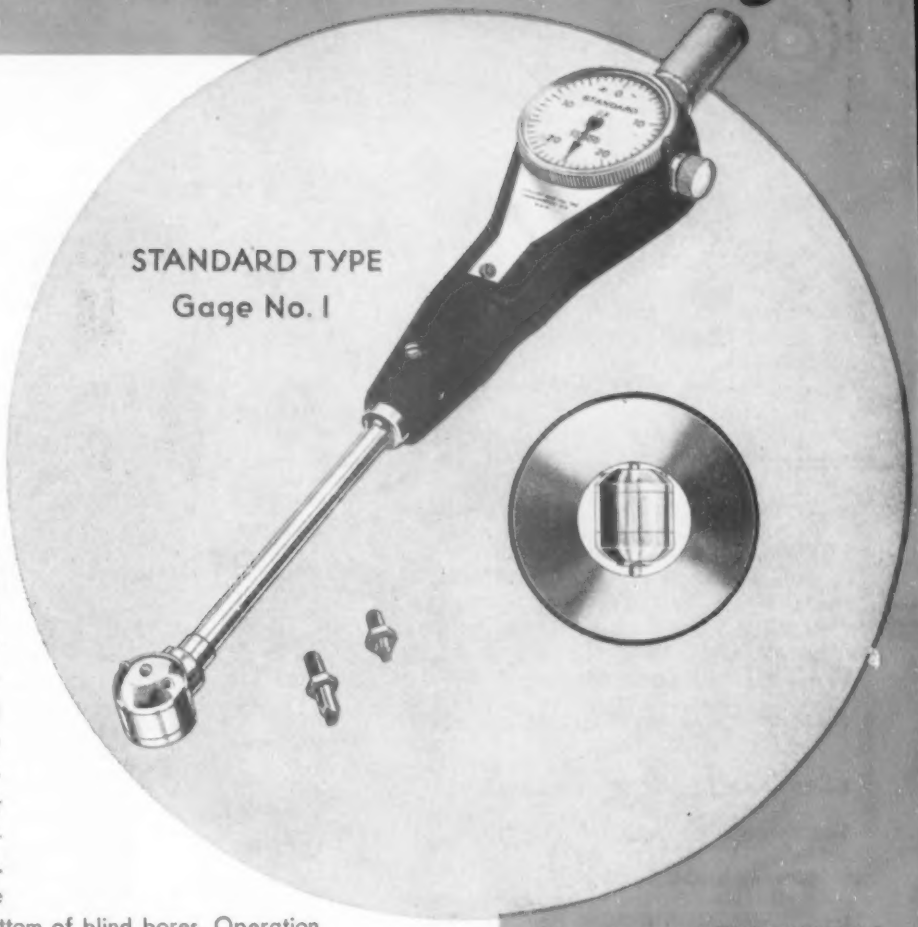
Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

A NEW STANDARD Dial Bore Gage

for measurements ranging from 5/8" to 1" with UX Indicator graduated in .0001"

Fast, Light, Accurate...



HERE'S the newest addition to the STANDARD family of Dial Bore Gages. A small, lightweight, fast, close-tolerance checking instrument for small bores comparable in accuracy with the larger size dial bore gages.

Utilizing the same centralizing principle of other STANDARD Dial Bore Gages, it is only necessary to insert the gage, and rock handle slightly. Minimum reading on indicator shows exact diameter. Even holes with obstructions such as shoulders, webs, undercuts. etc., can be measured because this Dial Bore Gage can measure within ¼" from the bottom of blind bores. Operation is reduced to a minimum; accuracy and precision assured; and the range of workability is considerably increased as a result of improved design.

Other Dial Bore Gages with measuring range to 12⅛" completely illustrated and detailed in our new No. 10 Catalog. Send for it.

New, improved STANDARD Dial Bore Gage with diameter extensions furnished with each gage. Cross section shows gage in use.

STANDARD Dial Snap Gage

Combines Snap Gage Speed with Comparator Precision

STANDARD Dial Snap Gages combine PORTABILITY with speed in use and absolute accuracy on dimensions as fine as .0001". Adjustable gaging pin has a serrated flat surface tipped with tungsten carbide that practically defies wear. Opposite movable pin has mushroom top, also tungsten carbide. Point-and-plane construction assures continued, accurate readings whether instrument is set by cylindrical or flat standards.

16 Stock Sizes cover Range 0" to 8". Each can be set to measure any dimension within a range of ½". Sizes measuring up to 4" designed as at right. Sizes 4" to 8", because of larger size, are made with convenient finger hole grip for greater ease in handling.

Write for Special Bulletin on STANDARD Dial Snap Gages.

ARMY (E) NAVY

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

Completely Cold Forged

CONTINUE TO BUY
U. S. WAR BONDS

OUTSTANDING FEATURES

1—INCREASED STRENGTH

2—CONTINUOUS UNCUT LATERALLY DEFLECTED CORE FIBRES.

3—CONTINUOUS UNBROKEN FIBRES.

4—SMOOTH FLAT TOP WITH SLIGHT CHAMFER.

5—CONCENTRICITY OF HEAD WITH BODY.

6—SOCKETS — UNIFORMLY ACCURATE TO FULL DEPTH OF HOLE—TRUE HEXAGONAL SHAPE—ACROSS FLAT SECTION DIAMETER IDENTICAL TOP AND BOTTOM —NO TAPER—SMOOTH REGULAR WALLS —WELL DEFINED CORNERS.

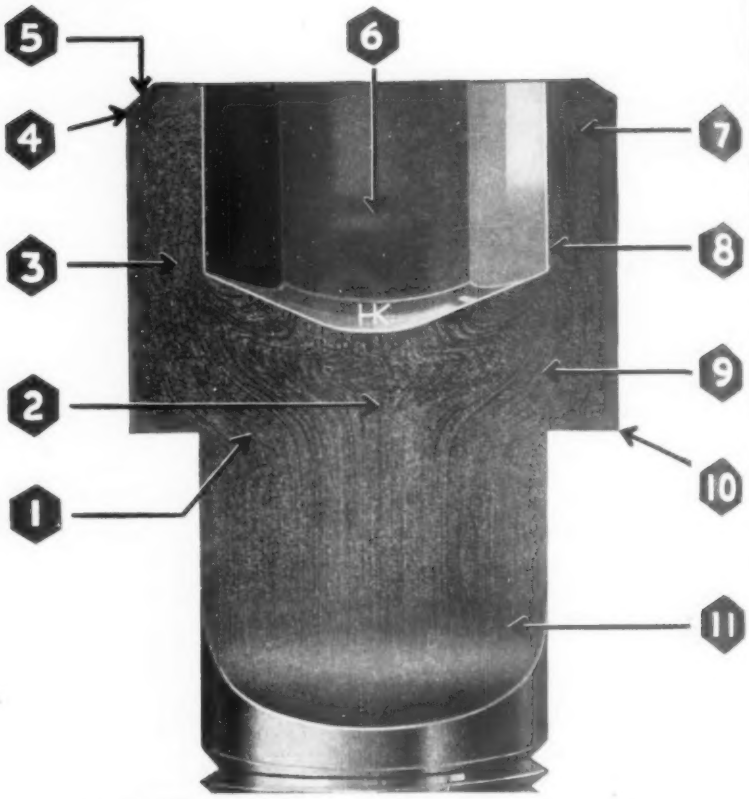
7—CONTINUOUS FIBRES ENDING IN SOCKET WALLS.

8—REINFORCED SOCKET WALLS.

9—CONTINUOUS UNCUT FIBRES.

10—SQUARE SHOULDERS.

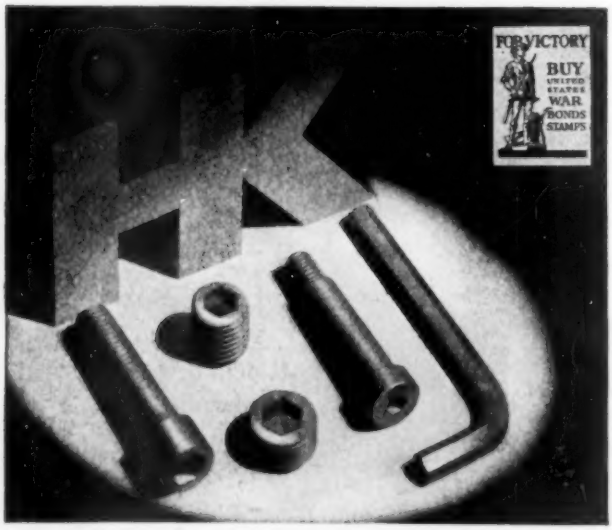
11—ORIGINAL CONTINUOUS FIBROUS STRUCTURE.



UNRETOUCHED PHOTO ETCHED CUTAWAY
HOLO-KROME SOCKET HEAD CAP SCREW

HOLO-KROME FIBRO-FORGED

TRADE MARK



SOCKET SCREWS

GUARANTEED Unfailing PERFORMANCE

FROM EVERY HOLO-KROME PRODUCT

THE HOLO-KROME SCREW CORP. HARTFORD 10, CONN., U. S. A.

VOLUME XIII JANUARY, 1944 NUMBER 1

THE TOOL ENGINEER

T. M. REG. U. S. PAT. OFF.

THE PUBLICATION OF MACHINE AND TOOL ENGINEERING

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Publisher's Letter

WE start a new year — a year fraught with possibilities—tremendously far-reaching changes for the entire world ....victory....cutbacks, more and more of them .... changes in design .... shifts in production .... adjustments in manpower .... post-war plans blossoming into full bloom .... more raw materials for civilian production .... changes, changes, changes .... most wondrous year in the last thousand. We face it confidently, with anticipation—a job to be done—we'll do it.

•

For production engineers, 1944 will be a year of transition—people are not thinking as they once did, mental attitudes and moods are different. These changes will be reflected in many ways — new materials with which to fabricate, new designs in products. All involve new concepts in machines and tools, new alloys, new techniques, new uses for old tools and methods—mostly, learned from stepped-up war production. Accumulated data, obsoleted by new developments, will be used, largely, as a basis for trial .... "this is a game", says Handy Andy, "for lifetime study".

January is always a time for retrospection, a time for planning for the year, of turning back the pages to see where we're going and where we've been.

•

I see we introduced in July our technical feature "Streamlined Production"—a staff-written and originated series on production know-how, that has gained many new friends and readers. I see our "hot page" entitled "Production Perspectives" has scored many news beats and "firsts"—its style and terseness have been imitated, a compliment from other professional publishers.

Also in this past year I see we initiated "Industrial News Digest" —a complete summary of all worthwhile news for the busy production executive. Our page on Machine Tools is a newer feature, reporting trends and developments in the machine tool world—the only page of its kind yet published.

•

We have had our production headaches too, for manufacturing many thousands of magazines results in a mass production problem. The enthusiasm of our staff licked the manpower problem.

Materials are far from plentiful—paper is biggest bug-a-boo. Last year we used ten per cent less than in 1942. This year we face another probable cut. We'll print no extra copies—fewer reprints of the articles, data sheets, other features so many of you have requested. Margins may be trimmed again, lighter weights may be necessary. Make your copy do double duty—pass it along to others .... save paper.... it will help win this war sooner.

Cordially yours,

Roy T. Bramson

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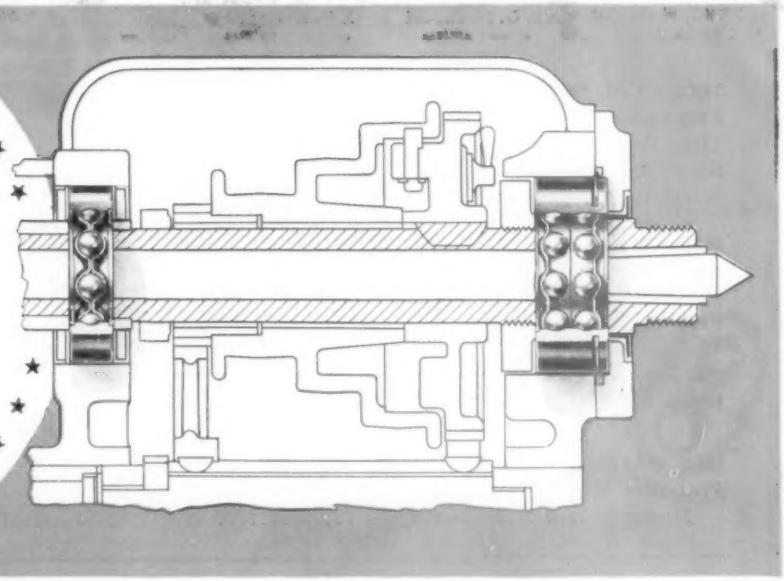
SUSTAINED *Spindle Accuracy!*

A FINER FEATURE OF LOGAN LATHES*

Brief
SPECIFICATIONS

- Swing over bed 10½"
- Bed length 43⅛"
- Spindle hole 25/32"
- Precision ground ways: 2 prismatic "V" ways; 2 flat ways
- 12 spindle speeds—30 to 1450 per minute



NO. 200 BACK GEARED SCREW CUTTING LATHE

NO. 850 MANUFACTURING TURRET LATHE

NO. 820 QUICK CHANGE GEAR LATHE

Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

Precision, Pre-Loaded Ball Bearing Headstock is Standard Equipment on All Models

Your purchase of a lathe is an investment. To be profitable, it should be a *long term* investment in speedy, accurate production. It will be if the lathe is a Logan, because Logan engineering designed it that way . . . throughout! For example, to assure sustained accuracy of the spindle, the headstock is equipped with special New Departure Ball Bearings. These bearings, of extreme precision, are pre-loaded so that the pressure of the cutting tool . . . either radial or thrust . . . causes a minimum deflection of the spindle. In addition to "pre-loading" . . . these ball bearings are grease sealed . . . requiring no lubrication and no adjustment for their entire life. Moreover, the higher operating speed of the Logan Lathe, due to its ball bearing spindle mounting, enables a shop to take every advantage of modern, high speed cutting methods. Production is increased and unit costs reduced.

Write for catalog sheets so that you can compare before you buy.

LOGAN ENGINEERING COMPANY
CHICAGO 30, ILLINOIS

*This advertisement is one of a series describing the finer features of Logan Lathes . . . Look for the next of the series

MAINE STEEL, INC. *Reports . . .*

"Greatest Time and Money Saver in Die-sinking Machinery in 25 Years!"

"You may remember that about a year ago you sold us a Rotary Head Die-Sinking Machine. We feel that it is time that we told you what we think of it.

The Rotary Head principle has saved us more time and money than any other improvement in Die-Sinking Machinery since Cherrying Attachments were invented more than twenty-five (25) years ago.

The principal reason is that we can sink four (4) impressions complete without moving the work on the table.

This saves three (3) setups out of four (4) when compared to a Rotary Table Machine.

This saving would of course be increased where more than four (4) impressions are needed.

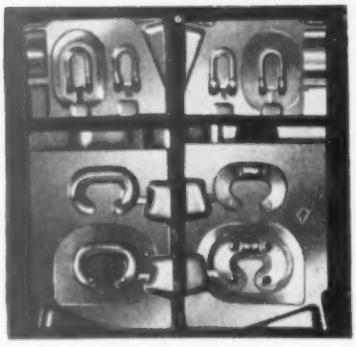
Besides this — the various movements built into this Rotary Head enable us to sink our dies without first laying them out on the Die Blocks.

The machine does its own layout work.

And after a year's experience we can say that these two features have averaged to save us over 30% of our die-sinking time.

Yours very truly,

MAINE STEEL, INC.
A. A. Rines
Foreman—Die Sinking Dept. "



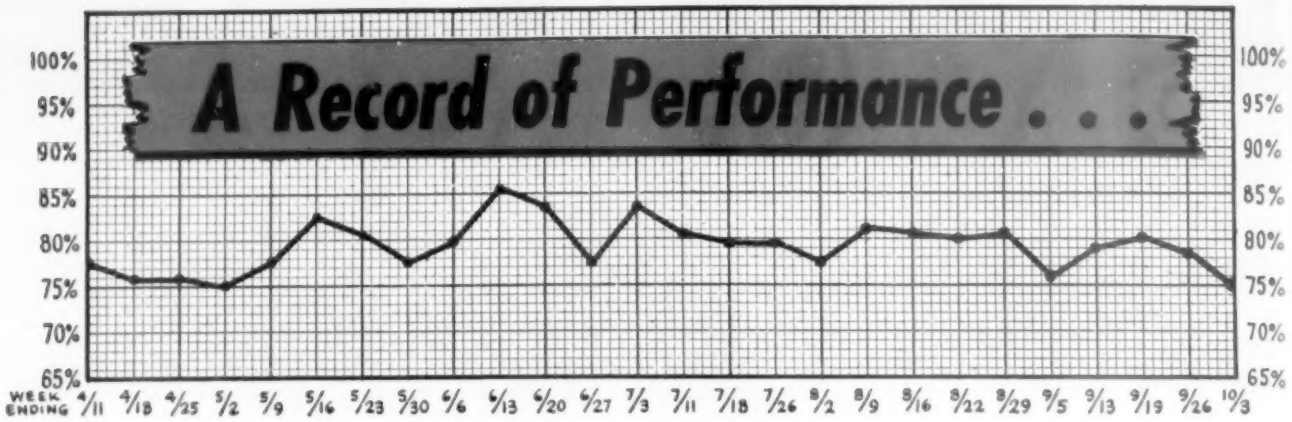
This is typical of the forging dies produced by Maine Steel, Inc. The Milwaukee Rotary Head Miller has saved this firm over 30% in die-sinking time on dies of this type.

Kearney & Trecker's Rotary Head Miller is regarded by the majority of users as the most versatile machine ever designed for die and mold work. Direct — fast — accurate — it reduces initial job preparation and set-up time to the minimum — saves operator's time and assures rapid production of dies and molds. Write for Bulletin No. 1002C for full information on this unusual machine tool.

Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

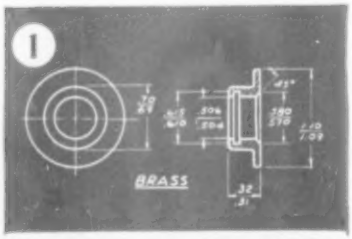


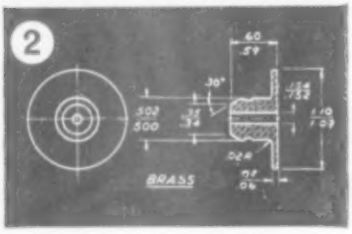
In Screw Machine Operations

● Here's a war production story that is typical of America's will to win: It's a story that deals with a factual record of screw machine operations from the files of a company recognized for its efficiency and excellence in production methods—the Briggs & Stratton Corporation.

Case History of Greenlee 6-Spindle Automatics

The graph above traces the average productive time of 10 Greenlee 6-Spindle Automatics over a 26 week period, while operating on a round-the-clock schedule — 3 shifts — 24 hours per day — 7 days per week. It takes into account all down-time charged against each machine's performance, regardless of cause. It includes all time losses due to power failures or tool breakage, as well as for ordinary time losses in making set-ups, re-tooling, etc. It includes major change-overs in set-ups on 4 machines during the period — the remaining machines operated without change-overs in set-ups. Duplicate tools were kept in readiness — changes were made in short order, and the high rate of production efficiency maintained — an over-all average of 79.01%. So we salute Briggs & Stratton Screw Machine division who have and are still efficiently producing a full share in America's production drive to Victory!





PRODUCTION DATA

Two of the parts produced on the Greenlees at the Briggs & Stratton plant are shown above. The sequence of operations are outlined below:

1 Part No. 453763 — Vane Holder Cap

Operations

1st Pos: Rough-form and spot for drill.
2nd Pos: Finish-form and drill hole.
3rd Pos: Recess.
4th Pos: Face front-end flat using Greenlee releasing holder; step-drill hole.
5th Pos: Ream (Step Reamer).
6th Pos: Cut-off.

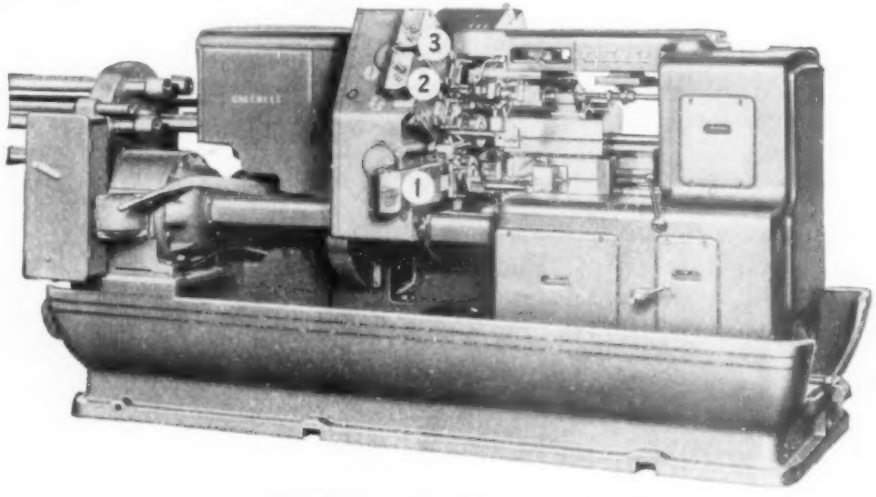
Production Rate — 600 Per Hour at 1400 R. P. M.

2 Part No. 453759 — Vane Holder

Operations

1st Pos: Rough-form ¼" depth, also large diameter; spot for drill.
2nd Pos: Finish-form small diameter; drill, using drill speeder.
3rd Pos: Finish-form large diameter.
4th Pos: Face front, using Greenlee releasing holder.
5th Pos: Shave and ream hole.
6th Pos: Cut-off.

Production Rate — 514 Per Hour at 1400 R. P. M.



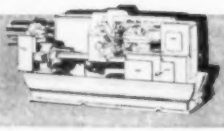
When operating with semiskilled or untrained help, you'll find the easy adjustments and open tooling area of Greenlee 6-Spindle Automatics of vital aid in overcoming operator problems. There are also features that contribute to a high rate of efficiency on short run jobs. *Write for full information*—

GREENLEE BROS. & CO., 1941 Mason Avenue, Rockford, Illinois

A Star Has Been Added

A star, awarded August 21, 1943, has been added to Greenlee's Army-Navy "E" Flag.

BUILDERS OF THE FAMOUS MULTI-STATION AUTOMATIC TRANSFER MACHINE FOR MASS PRODUCTION OF AIRCRAFT CYLINDER HEADS

GREENLEE  *Automatic Screw Machines*

Which Ozalid machine was designed for your drafting room?

A Model B . . . Like Grumman's
Grumman Aircraft Engineering Corp.
Bethpage, Long Island, New York

A Model F . . . Like Blaw-Knox's
Blaw-Knox Corporation
Pittsburgh, Pennsylvania

A Type 2600 . . . Like Standard Oil's
Standard Oil Company of New Jersey
Elizabeth, New Jersey

1. For large-scale print production. An Ozalid Model B will turn out whiteprints of your engineering drawings at speeds up to 20 feet per minute. Printing and Dry Developing are done in one continuous operation . . . and there are many exclusive features.

It can be relied upon for dependable and economical round-the-clock performance. *Price $2,850.00 F.O.B. Johnson City, New York.*

2. For medium production. The Model F is ideal when demands are moderate or occasional. It may also be used to supplement other equipment, or provide on-the-spot printmaking in departmentalized organizations.

The printer and developer are combined in one compact unit and whiteprints can be turned out at speeds up to 4 feet per minute. *Price $825.00 F.O.B. Johnson City, New York.*

3. For use with your present printer. If you have already installed expensive blueprinting equipment . . . you can add a Type 2600 Dry Developing unit and receive all the benefits of Ozalid Printmaking.

Expose Ozalid sensitized materials in your printer—then transfer to the Type 2600. Rate of development is approximately 5 feet per minute. *Price $370.00 F.O.B. Johnson City, New York.*

YOU CAN'T HAVE THIS VERSATILITY—WITHOUT AN OZALID MACHINE

Ozalid's Dry Development distinguishes it from all other printmaking processes. It eliminates baths, driers, plumbing connections—is responsible for compact machine design.

What's most important, it allows you to use a full line of sensitized materials and obtain exclusive printmaking "extras".

WITH OZALID YOU CAN:

Make prints having blue, black, maroon lines on white backgrounds.

Produce duplicate "originals"; reclaim soiled or worn tracings; eliminate drafting waste when making corrections.

Use cut sheets as well as roll stock—eliminate trimming waste.

Turn out all prints in the same manner. No variations in production.

WRITE FOR CATALOG AND SAMPLES OF OZALID WHITEPRINTS.

OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORPORATION

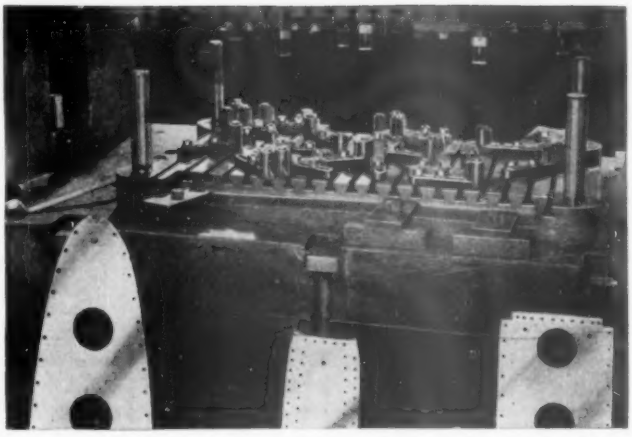
JOHNSON CITY, N. Y. ★ OZALID IN CANADA—HUGHES OWENS CO., LTD., MONTREAL

ADJUSTABLE DIES
SPEED WAR PRODUCTION

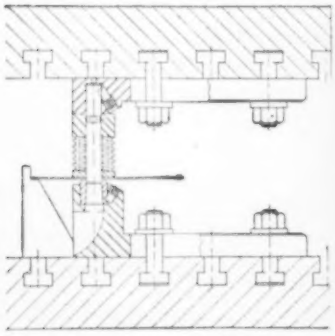
INCREASE HOURLY PRODUCTION—REDUCE "DOWN" TIME

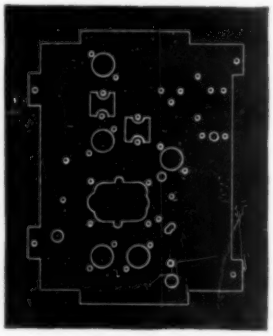
Whistler adjustable die set-up for 12 foot power brake. These same punch and die units can be quickly rearranged for other patterns.

Whistler Adjustable dies are saving the day in war plant "speed-up" schedules by... saving weeks of time normally required in single purpose die making... units can be used over and over in different patterns... new set ups on or off the press in minutes... all parts interchangeable ...work on any type press... perfect precision on long or short runs... no special tools and new workers quickly learn to make press changes.

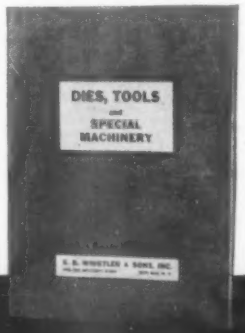


Another grouping of Whistler Adjustable Dies illustrating re-use of same units. Note close grouping of perforations.





Side view showing construction detail of U-50 Whistler Adjustable Punch and Die unit and typical example of perforated and notched piece produced by Whistler Dies.



Over 25 Years of Tool and Die Making Experience

S. B. WHISTLER & SONS, Inc.

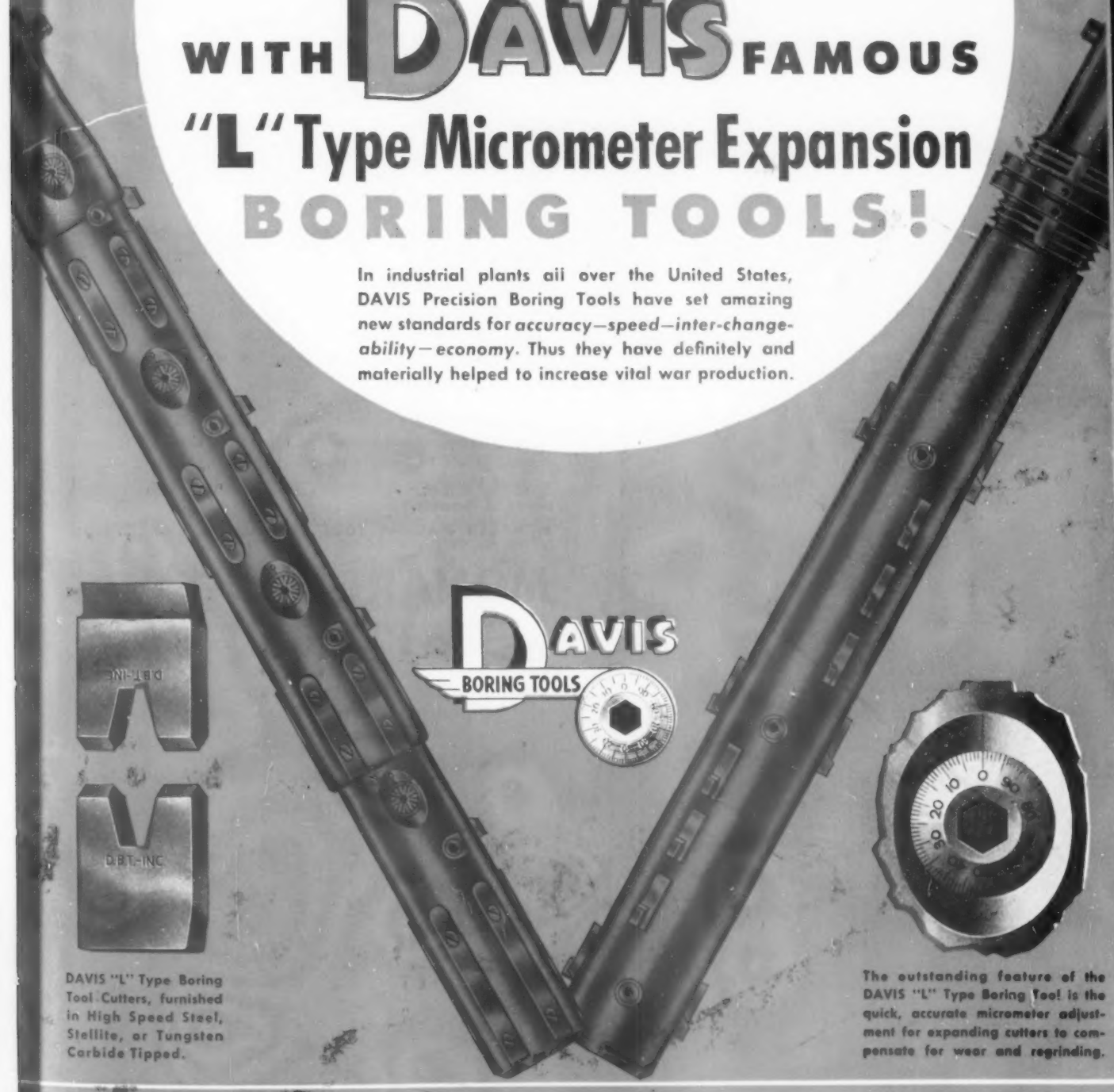
752-756 MILITARY ROAD BUFFALO, N. Y.

Every Production Executive needs this fully illustrated catalog. Sent upon request.

War Production Increased

WITH DAVIS FAMOUS "L" Type Micrometer Expansion BORING TOOLS!

In industrial plants all over the United States, DAVIS Precision Boring Tools have set amazing new standards for *accuracy—speed—inter-changeability—economy*. Thus they have definitely and materially helped to increase vital war production.

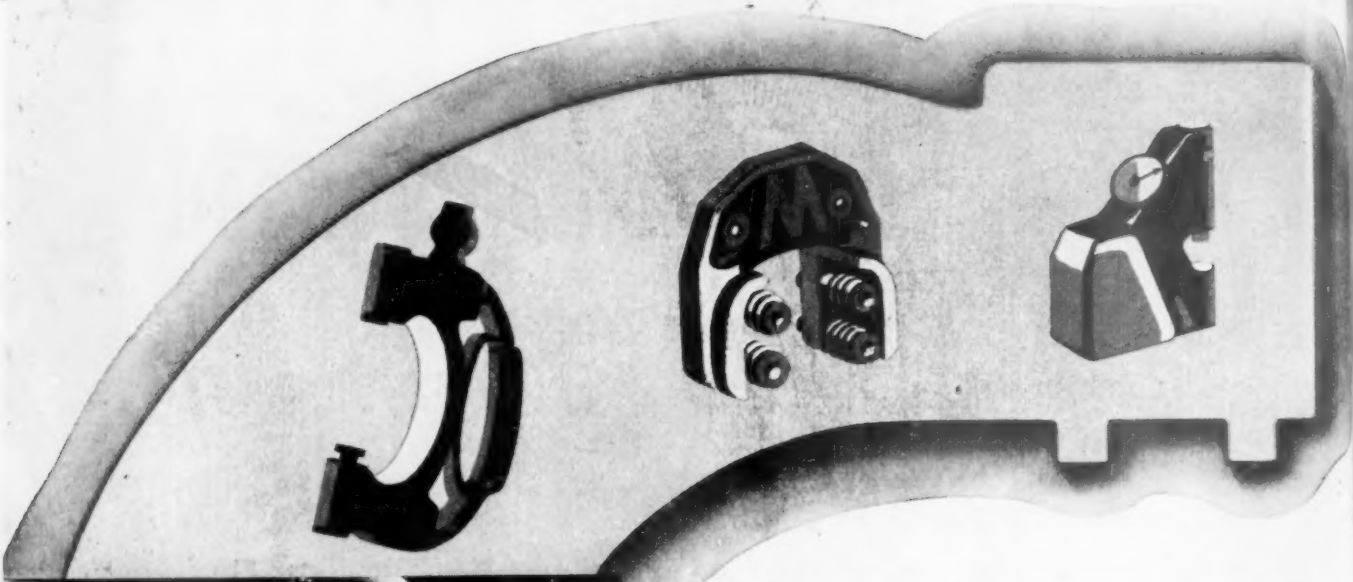


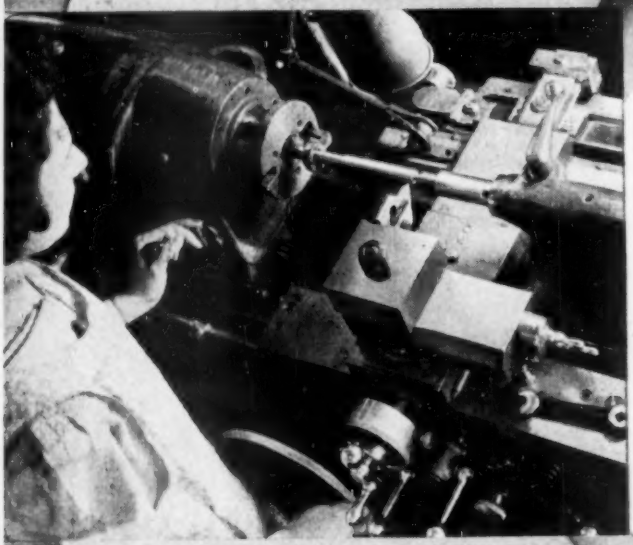
DAVIS "L" Type Boring Tool Cutters, furnished in High Speed Steel, Stellite, or Tungsten Carbide Tipped.

The outstanding feature of the DAVIS "L" Type Boring Tool is the quick, accurate micrometer adjustment for expanding cutters to compensate for wear and regrinding.

DAVIS BORING TOOL DIV. LARKIN PACKER CO., INC., ST. LOUIS, U.S.A.

Precision Gauges came first





Before war production could start, precision gauges to insure high precision and interchangeability of parts, had to be made in undreamed-of quantities. A mere handful of gauge manufacturers who had the "know-how" were given the job.

Monarch's assignment for 1941 was more than double any previous year's production of tool and gauge maker's lathes. On November 11th, 1941, we got a Navy "E" award for more than fulfilling our assignment.

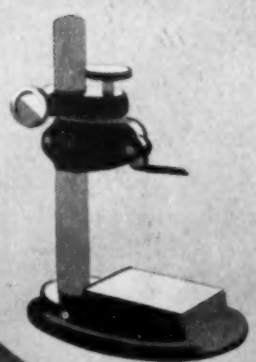
The precision gauge making for war production is now well in hand. Soon, new precision gauges for better peacetime production will be needed. The hundreds of Monarch lathes in the gauge makers plants still retain their in-built accuracy and will do as good Peacetime job as they did a War job in the tool-rooms of America.

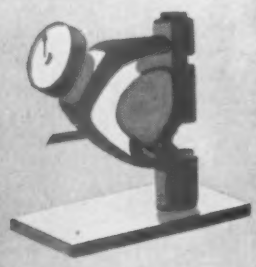
MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

MONARCH LATHES

Save Time

Chasing thread gauge laps on a Monarch Sensitive Precision Toolmaker's Lathe, in a large precision gauge plant.

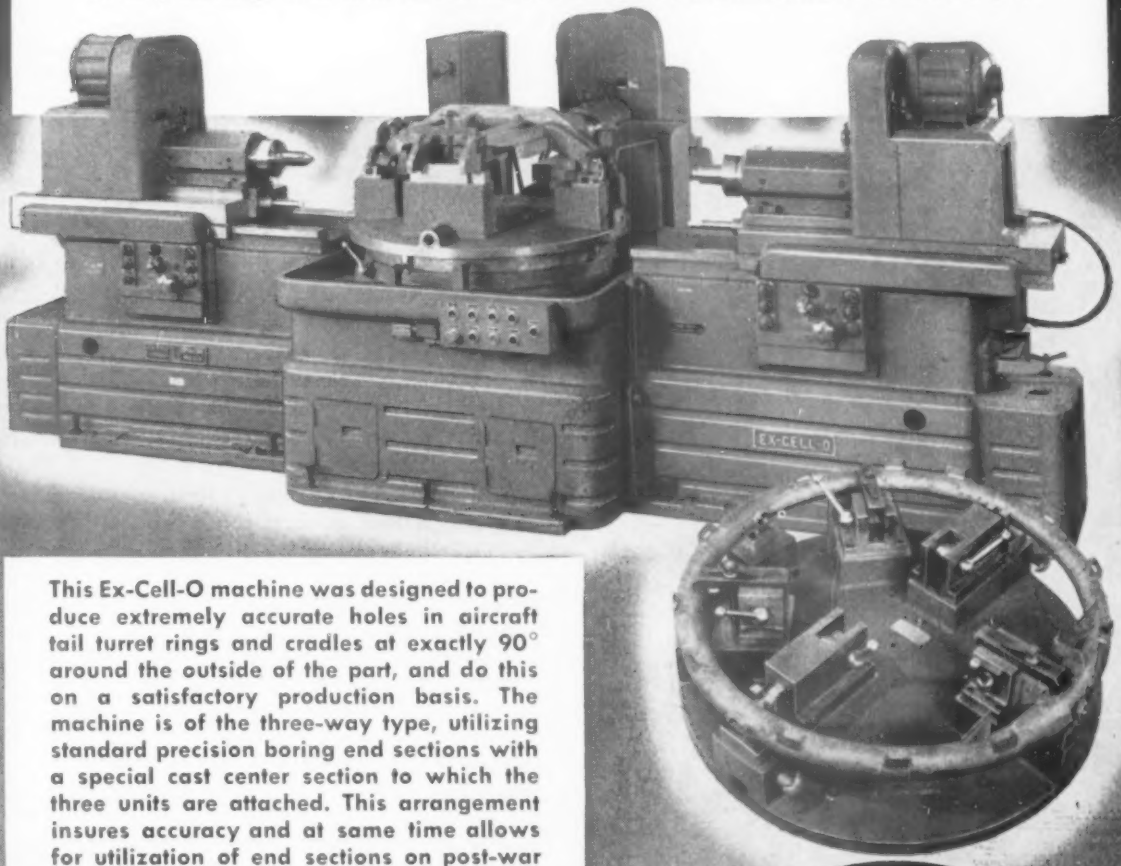




The Standard for Tomorrow!

The Emphasis Will Be On More Accuracy . . . With Production

The trend for tomorrow's civilian production is definite . . . the increasing use of special or semi-special machines that will enable manufacturers in general to attain the extreme accuracy the users of high precision machines are now obtaining in the aircraft and other war industries. Typical of these precision machines is the one illustrated here, a practical application of the Ex-Cell-O precision boring process to vital aircraft parts. This Ex-Cell-O machine indicates the flexibility, accuracy and simplicity in use, with resulting money-saving, that will be demanded of *precision* machine tools tomorrow.



This Ex-Cell-O machine was designed to produce extremely accurate holes in aircraft tail turret rings and cradles at exactly 90° around the outside of the part, and do this on a satisfactory production basis. The machine is of the three-way type, utilizing standard precision boring end sections with a special cast center section to which the three units are attached. This arrangement insures accuracy and at same time allows for utilization of end sections on post-war work. Two parts are machined; one a tail turret ring of steel *(in insert)*; the other, a tail turret cradle of magnesium *(on machine)*.

EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

XLO

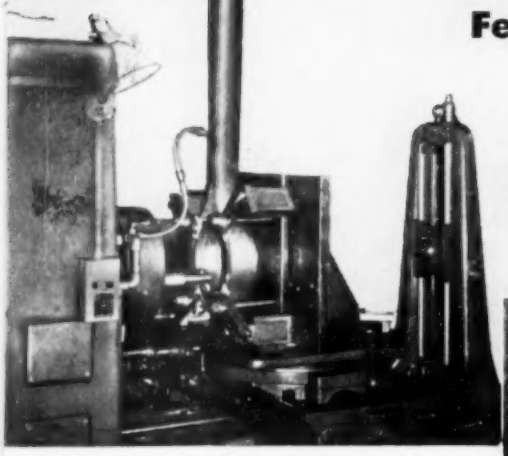
EX-CELL-O *for* PRECISION

PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES BROACHES • GRINDING SPINDLES • HYDRAULIC POWER UNITS • DRILL JIG BUSHINGS TOOL GRINDERS • CONTINENTAL CUTTING TOOLS • DIESEL FUEL INJECTION EQUIPMENT PURE-PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS

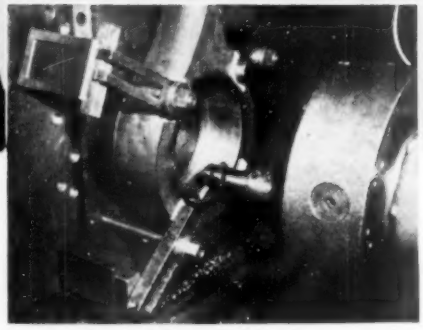
How to Bore and Thread UNUSUAL JOBS...

This G. & L. Machine with G. & L. Continuous Feed Facing and Boring Head Does Both . . .

IN ONE SETTING!



(Above) Showing method of mounting connecting rod on machine. Opposite end is supported by overhead hoist. Machine is G.&L. Table Type Machine.



(Above) Rough, semi and finish boring, counter-boring and threading operations are performed in one setting.

(Left) Close up of threading operation being performed by G. & L. Continuous Feed Facing and Boring Head. See below for additional data on this attachment.

This large connecting rod forging presents an unusual machining operation due to its size and the operations required. The operations consist of rough, semi and finish boring, counterboring and threading a 12″ diameter bore. The thread is a thread, approximately 2″ long, with 10 threads per inch N.S.F. Class-3 Fit. A Giddings & Lewis 17″ diameter Continuous Feed Facing and Boring Head, mounted on the headstock of a G. & L. 25-RT Horizontal Boring, Drilling and Milling Machine, is used for the threading operation.

(Above) The G. & L. Continuous Feed Facing and Boring Head with main spindle of the machine extended through the hardened steel bushing of the attachment. Also shown is the driving method and the flanged gear.

Mounting of the attachment requires only a few minutes of the operator's time. The five features described below make for easy, rapid adjustment and operation.

Because of its unusual design and construction, the continuous feed facing and boring head makes possible many operations and combinations of operations not ordinarily performed with the horizontal boring, drilling and milling machine.

A wide range of standard tools is available for use with this attachment. Special tools can be designed and built for specific applications.

1 **Tool Slide**—Has six separate power feeds ranging from .009″ to .118″ per revolution of head.

2 **Feed Selector**—Control is provided for selection of any one of six feeds.

3 **Directional Control**—Lever points in direction of tool slide feed.

4 **Micrometer Adjustment**—Graduated to .001″ for tool slide adjustment.

5 **Two Tool Holders** with 3/4″ tool bits furnished as standard equipment.

Reduce Settings and Save Time with this G. & L. Continuous Feed Facing and Boring Head

This attachment will help you do a lot of unusual jobs on your horizontal boring, drilling and milling machine. In addition to threading, it can be used for boring and facing *simultaneously.*

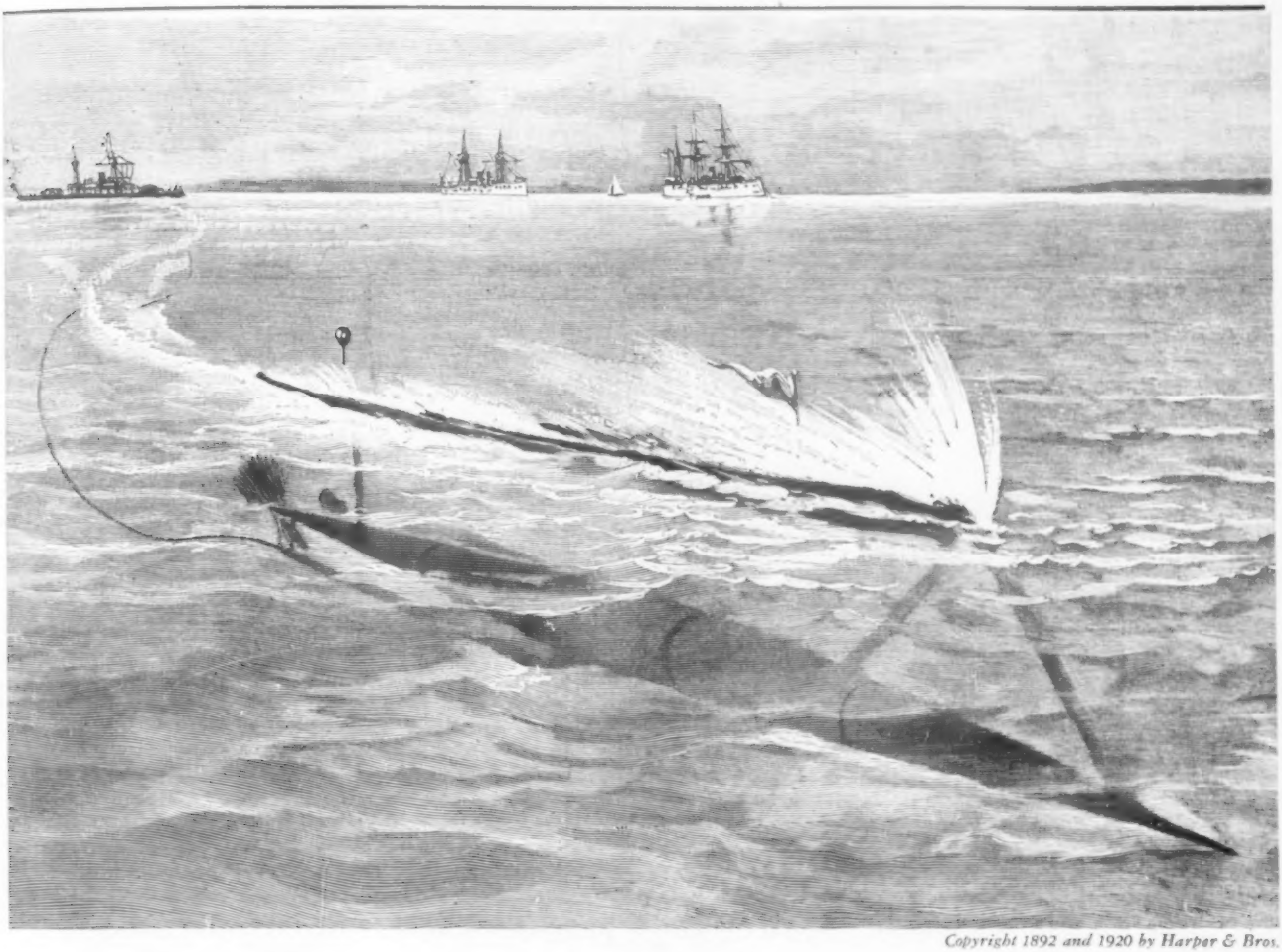
Additional Data

. . . covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin No. TE 14.

GIDDINGS & LEWIS MACHINE TOOL CO.

122 ROTY STREET FOND DU LAC WISCONSIN

"This is a Grinding War . . ."



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EDISON'S FISH

Here's a "secret weapon" that never went to war. But it caused a lot of excitement back when Dad was a boy!

It was called the Sims-Edison electric torpedo—a motor driven torpedo supported by a float and controlled and powered through a long extension cord!

It's a far cry from Edison's fish to the modern pneumatic torpedo which contains thousands of moving parts, is built like a watch, costs around $20,000 and rolls off production lines in staggering numbers.

When you consider what an intricate mechanism the torpedo is—and that it is only one item on today's list of war weapons—can you but marvel at America's war output.

That output is a miracle of mass production that was made possible, in part, when, over fifty years ago, the first man-made abrasive was created and the grinding wheel became a production tool.

Since then, engineers have learned how to grind mechanical parts to split-hair accuracy. This accuracy led to interchangeability of parts. And interchangeability, in turn, made mass production possible.

Today you can't put your finger on a single weapon that flies, sails, rolls, shoots or explodes that isn't in some way touched by grinding. Knowing that "this is a grinding war", we at Carborundum are acutely conscious of our responsibility to war industry. And we are constantly striving to develop new ways in which grinding can serve you better.

As a result, many new war-born applications for cylindrical, centerless, surface, tool room and other forms of grinding have already been developed. They are speeding production of tanks, ships, machine guns, rifles, machine tools, shells, projectiles, optical lenses and thousands of other instruments of war.

But we are also mindful that grinding plays a part in the production of nearly every article built for peace and that today's grinding developments will have a wider application than ever after Victory.

* * *

Every hour this war is shortened will save $12,000,000. The lives it will save are priceless. So please remember that grinding wheels, too, are "Weapons for Production" . . . use them wisely to help end the war sooner.

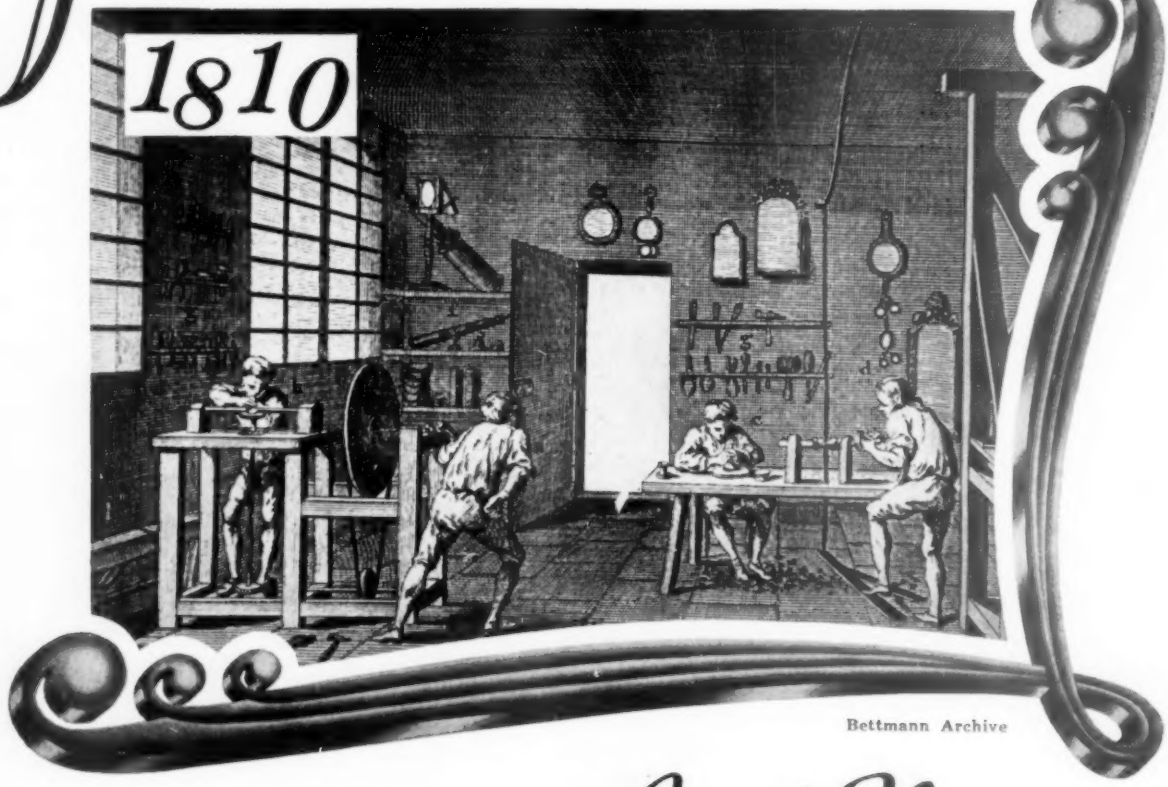
The Carborundum Company, Niagara Falls, New York.

ARMY E NAVY

THE CARBORUNDUM COMPANY

CARBORUNDUM AND ALOXITE ARE REGISTERED TRADE-MARKS OF AND INDICATE MANUFACTURE BY THE CARBORUNDUM COMPANY

Just imagine production then



Bettmann Archive

. . . And Now

ILLUSTRATED is the workshop of a maker of scientific instruments, spectacles, telescopes, etc., taken from an engraving published in 1810 in the Panorama of Professions. Note that the motive power was by hand or foot, while much of the actual work was done by hand. Compared by the standards of today, there just was no such thing as production. Perhaps the greatest single improvement over the old methods was the advancement in the use of air and hydraulics . . . the application of air or hydraulic pressure for the operation of chucks, work holding and ejecting devices, assembling presses and many other labor saving devices. Let "Logan" Engineers make recommendations on modernizing your plant with the application of "Logan" *Air* and *Hydraulic Equipment.*

"LOGAN"

LOGANSPORT MACHINE, INCORPORATED
902 PAYSON ROAD LOGANSPORT, INDIANA
Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories

Beyond a shadow of a DOUBT!

In inspection operations there is no way of gaging the consequences of doubt . . . but there's one sure way of gaging *beyond a shadow of a doubt!*

That method is with the use of **Jones & Lamson Optical Comparators,** projection machines for measuring and comparing objects by means of a magnified shadow.

- They measure angles in degrees and minutes; lead or spacing; height or depth . . . They photograph the enlarged shadow, without the need of a dark-room . . . They compare objects with a master outline . . . They permit rapid inspection and measurement of the many forms that are difficult or even impossible to inspect by direct gaging.

Any man or woman with a few minutes of instruction can operate this machine with speed and precision—a matter of particular importance in these days of manpower shortage.

There's an experienced Jones & Lamson Inspection Engineer near you. Call, write or wire for this service to Jones & Lamson Machine Company, Springfield, Vermont.

For rapid, economical inspection . . . BEYOND A SHADOW OF A DOUBT!

•

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies

JONES & LAMSON
MACHINE COMPANY
OPTICAL COMPARATORS Springfield, Vermont, U.S.A.

PROFIT-PRODUCING MACHINE TOOLS

"HOW IS POR-OS-WAY DOING ON HIGH-SPEED STEEL CUTTERS?"

Dear Charlie:
You wanted to know how Por-os-way's doing on high-speed steel cutters. So here goes from the [redacted] plant. These cutters are for finning airplane cylinder barrels. Production is up 66 2/3%. no more burning and no rejects. The boys are sure fussy about their work and sold on Por-os-way. Can you blame 'em?
Your roving reporter,
"Vic"

READ THIS, WRITES
POR-OS-WAY'S
WAR PLANT REPORTER

THE JOB:
Grinding sets of Huther high-speed steel cutters for finning airplane cylinder barrels on a universal tool and cutter grinder.

THE WHEEL: Por-os-way 7" x ½" x 1¼" 9A60HV2.

All facts and figures given are taken from an actual field survey made by a Por-os-way correspondent.

THE RECORD	POR-OS-WAY WHEEL	FORMER WHEEL
Production per man per hour	5 sets (20 pcs.)	3 sets (12 pcs.)
Pieces per dressing	8 to 12	3
Wheel life	8 hours	6 hours
Stock to be removed	.010"—.018"	Same
Depth of cut per pass	.003"	.001"
Rejects	None	0.5 to 1%
Operations eliminated	Cutting shoulder	
Production Increase	66⅔%	
Remarks: Former wheel burned work. Por-os-way grinds cool, holds corner.		

Write for complete booklet "Facts About Por-os-way". The address is 462 Wheatland Street, Phoenixville, Pennsylvania.

2 TO 5 TIMES MORE WAR PRODUCTION PER MAN PER MACHINE

POR-OS-WAY* *a new* RADIAC* PRODUCT

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to VALLEY FORGE

*T. M. Reg. U. S. Pat. Off.
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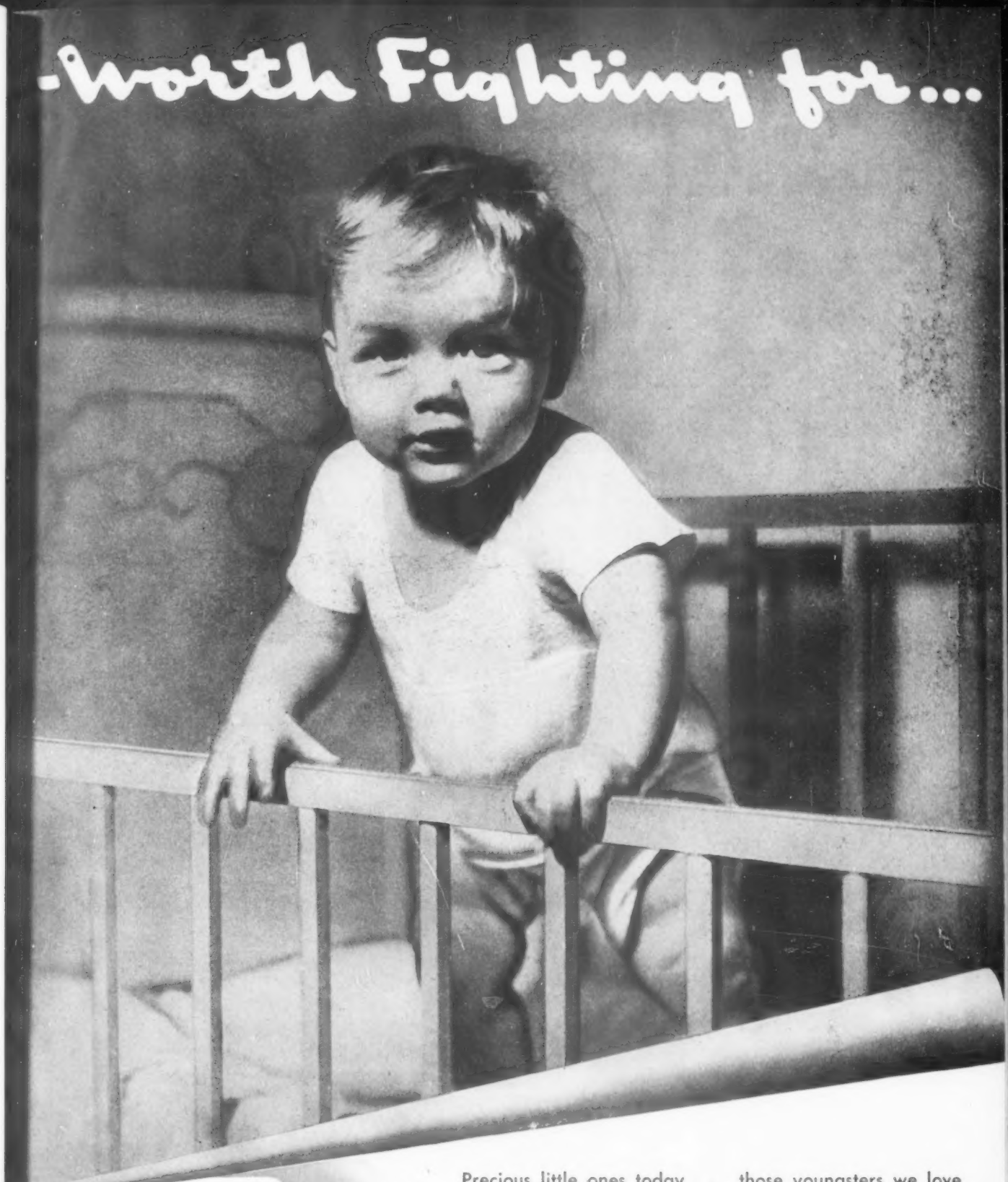


Precision Built Milling Machines Since 1888

KEMPSMITH

Precious little ones today . . . those youngsters we love and cherish . . . are destined to be the staunch American citizens of tomorrow. What the future has in store for them depends entirely on what YOU and I do in the present world conflict. Our job is to supply the Armed Forces with vitally needed war equipment. We dare not let them down . . . we must

STAY ON THE JOB!

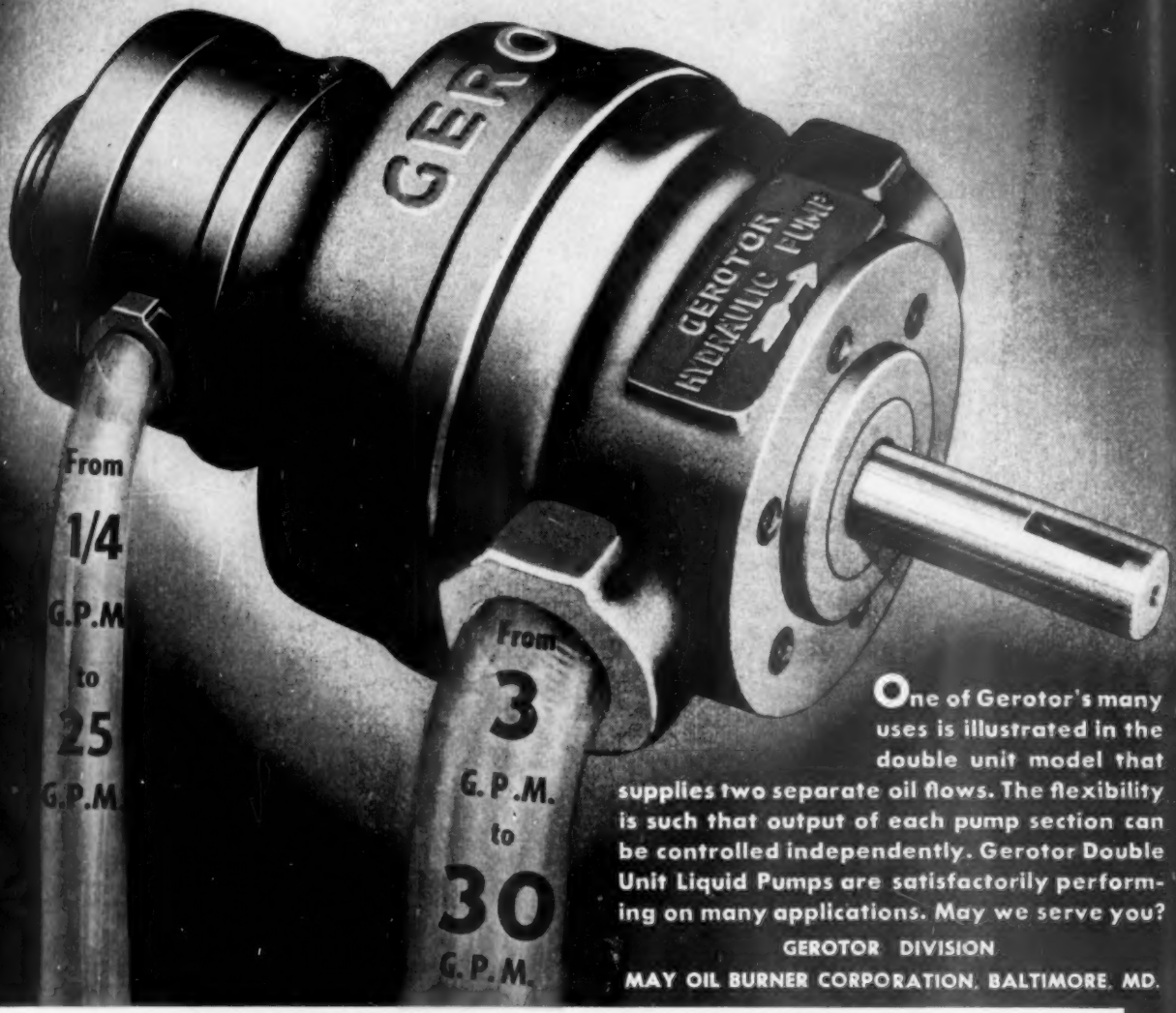
KEMPSMITH MACHINE COMPANY • MILWAUKEE 14, WIS., U. S. A.

PRONOUNCED JER-O-TOR

REG. U. S. PAT. OFFICE

GEROTOR

DOUBLE UNIT LIQUID PUMPS



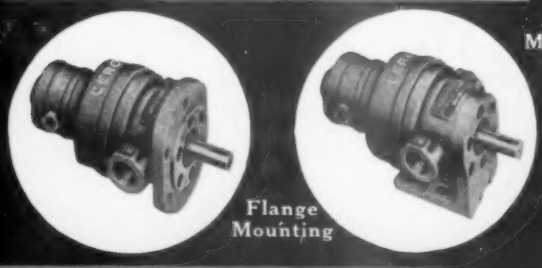
One of Gerotor's many uses is illustrated in the double unit model that supplies two separate oil flows. The flexibility is such that output of each pump section can be controlled independently. Gerotor Double Unit Liquid Pumps are satisfactorily performing on many applications. May we serve you?

GEROTOR DIVISION

MAY OIL BURNER CORPORATION, BALTIMORE, MD.

★ AVAILABLE CAPACITY COMBINATIONS ★

3 G.P.M. & 1/4 G.P.M.	8 G.P.M. & 1 G.P.M.	12 G.P.M. & 8 G.P.M.	25 G.P.M. & 1/4 G.P.M.	30 G.P.M. & 1/4 G.P.M.
3 G.P.M. & 1/2 G.P.M.	8 G.P.M. & 3 G.P.M.	20 G.P.M. & 1/4 G.P.M.	25 G.P.M. & 1/2 G.P.M.	30 G.P.M. & 1/2 G.P.M.
3 G.P.M. & 1 G.P.M.	8 G.P.M. & 5 G.P.M.	20 G.P.M. & 1/2 G.P.M.	25 G.P.M. & 1 G.P.M.	30 G.P.M. & 1 G.P.M.
5 G.P.M. & 1/4 G.P.M.	12 G.P.M. & 1/4 G.P.M.	20 G.P.M. & 1 G.P.M.	25 G.P.M. & 3 G.P.M.	30 G.P.M. & 3 G.P.M.
5 G.P.M. & 1/2 G.P.M.	12 G.P.M. & 1/2 G.P.M.	20 G.P.M. & 3 G.P.M.	25 G.P.M. & 5 G.P.M.	30 G.P.M. & 5 G.P.M.
5 G.P.M. & 1 G.P.M.	12 G.P.M. & 1 G.P.M.	20 G.P.M. & 5 G.P.M.	25 G.P.M. & 8 G.P.M.	30 G.P.M. & 8 G.P.M.
5 G.P.M. & 3 G.P.M.	12 G.P.M. & 3 G.P.M.	20 G.P.M. & 8 G.P.M.	25 G.P.M. & 12 G.P.M.	30 G.P.M. & 12 G.P.M.
8 G.P.M. & 1/4 G.P.M.	12 G.P.M. & 5 G.P.M.	20 G.P.M. & 12 G.P.M.	25 G.P.M. & 20 G.P.M.	30 G.P.M. & 20 G.P.M.
8 G.P.M. & 1/2 G.P.M.				30 G.P.M. & 25 G.P.M.



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FOR **50** YEARS
Specialists in
Tracer-Controlled
MILLING

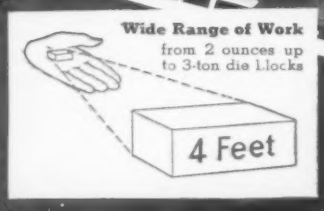
The Right Sized Machine for Every Die and Mold Job. Also Production Milling . . . Profiling

A *Complete* Service

MACHINES from 500 to 21,000 lbs.

SPINDLE SPEEDS from 33 to 12,000 rpm.

SPINDLES POWERED from ¼ to 10 hp.



CUTTER GRINDERS
ETCHING MACHINES
2- AND 3- DIMENSIONAL ENGRAVING MACHINES
VERTICAL & UNIVERSAL HEAD MILLERS
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- ☐ Electric Arc Etchers
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Name _____ Title _____

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GORTON
RACINE, WIS., U.S.A.
50 YEARS OF PRECISION TOOLS

GEORGE GORTON MACHINE CO.

1322 RACINE STREET, RACINE, WISCONSIN, U.S.A.

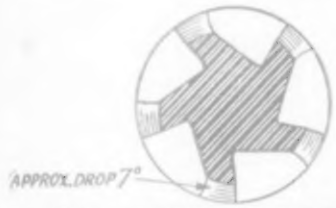
SHARP PRACTICE !

Good cutting tools deserve to be sharp . . . and it takes no more time to sharpen them right than it does to sharpen them wrong.

That universally used small tool, the Countersink, is a perfect example . . . **correctly** sharpened, its productive output is increased —its useful life extended.

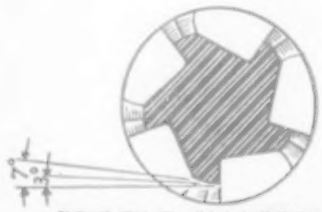
The right way to sharpen a Countersink is illustrated and described on this page. There's nothing tricky or difficult about it . . . Simply read, study the diagram and remember that a dull or incorrectly sharpened Countersink is a net loss.

Regardless of the type of countersink (pilot or self-centering) its cutting edges are either ground cam relief or profile ground. Gairing countersinks are always furnished with ground cam relief flutes.



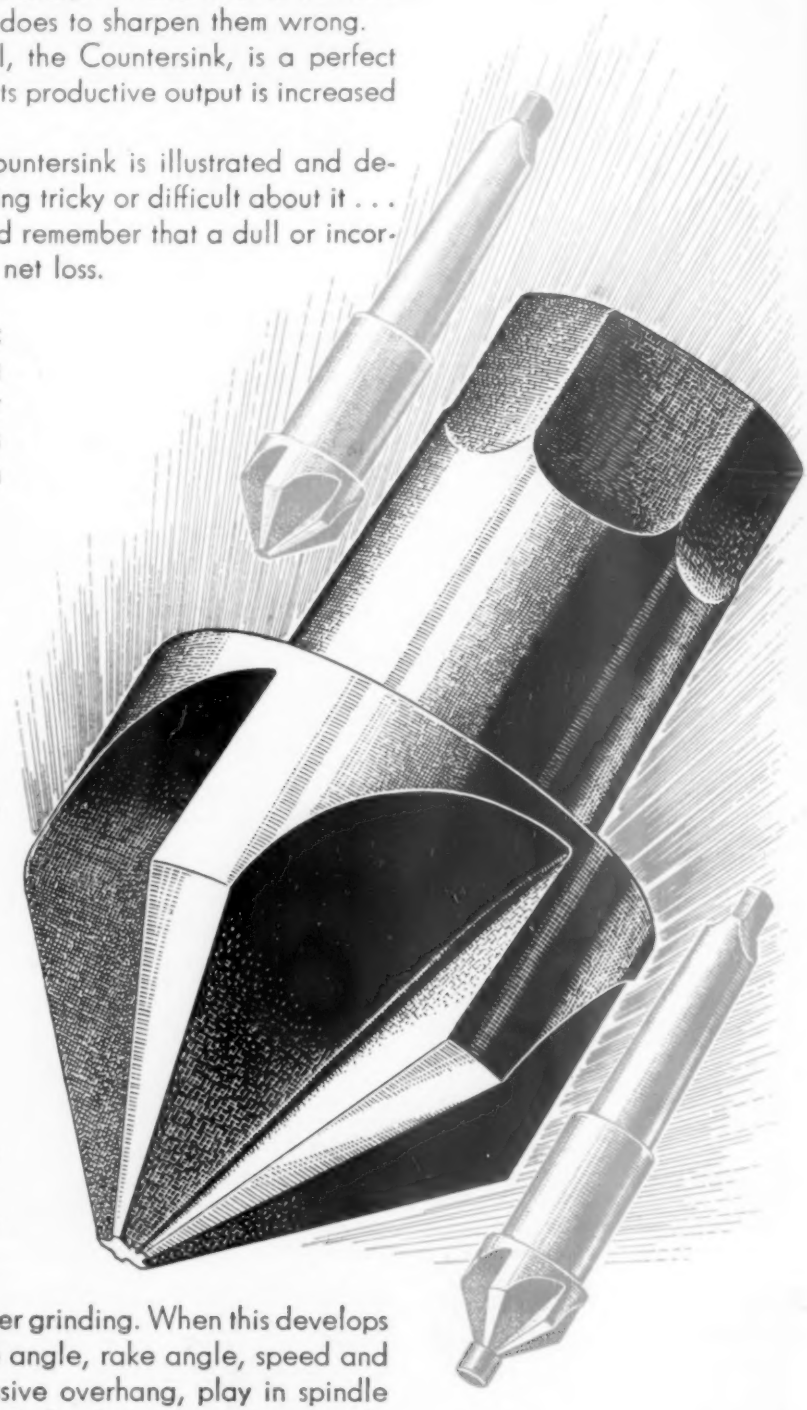
CAM RELIEF SHARPENING

1) Follow the original cam relief **or**
2) grind the face of the flute.



PROFILE SHARPENING

Always keep the angles as close as possible to the original flute design—Primary Land 3 degrees, Secondary Land 7 degrees.



. Chatter may be caused by improper grinding. When this develops check insufficient end cutting edge angle, rake angle, speed and feed not in proper relation, excessive overhang, play in spindle bearing. For countersinking in tough, hard steel use countersinks with fewer flutes. Provide ample chip space in web.

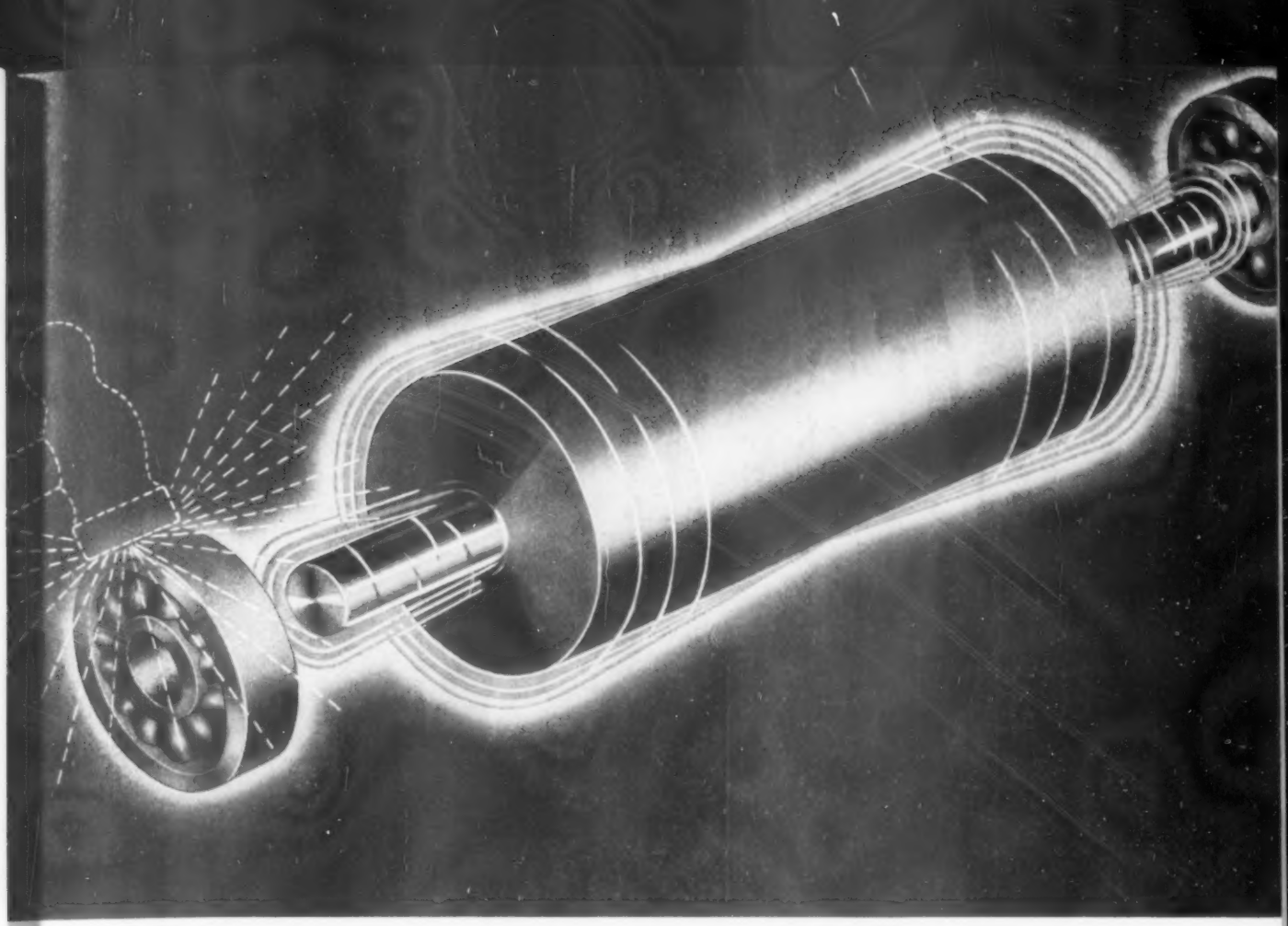
THE GAIRING TOOL COMPANY, Detroit 32, Michigan

Manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools

Gairing TOOLS

GAIRING
FOR A QUARTER CENTURY SPECIALISTS IN FINE CUTTING TOOLS

Reprints on request for posting in your grinding department.



What a beating these bearings would take!

THIS is what you may not *see* when an armature—or any other high speed part—is snugly mounted on its bearings. But you may be sure that the "whip" or "throw" caused by unbalance will deliver a blow at every revolution. And the higher the R.P.M., the harder the blow.

Call it "vibration" if you wish. But remember that vibration means punishment for any high speed assembly . . . punishment that strains, wears, and shortens the life of vital parts.

To eliminate this unbalance and vibration is the job which Gisholt Dynetric Balancing Machines accomplish more quickly, more easily, and more accurately than ever before. If your product can be improved by it, write for full information.

DYNETRIC BALANCING first enal you to *locate* the point of unbalance; t *measure* it for accurate correction. E tronic tubes amplify unbalance vibrati as much as 1,600,000 times.

GISHOLT MACHINE COMPANY
1219 East Washington Street • Madison, Wisconsin

Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements

TURRET LATHES - AUTOMATIC LATHES - BALANCING MACHINES - SPECIAL MACHINE

Do these symbols mean anything to you?

They do . . . if you have a government contract to make ▬▬▬ (censored).

▬▬▬ (Censored) is not a wishful weapon. It's real, and it requires precision finish which Egyptian understands completely.

TT-L-58 is a special clear spraying lacquer.

52-L-13 is a clear lacquer with an exceptional ability to mix with aluminum paint. We are probably the oldest clear lacquer people in the country. We know this product inside and out. We can provide the spec finishes for ▬▬▬ (censored) with the usual Egyptian plus as to quality and application.

Finish problems simplified — that's our business in time of war or peace. For your post-war products you can always depend on Egyptian Finishes . . . yes, always. *Special correspondence on finishing problems is invited.*

THE EGYPTIAN LACQUER MANUFACTURING COMPANY

ROCKEFELLER CENTER, NEW YORK 20, N.Y.

Egyptian's new U. S. Government "Spec" Book—4th Edition—is ready. It's helpful and it's FREE. Send for your copy. Please address Dept. E-1

EGYPTIAN FINISHES

EGYPTIAN

SUPERIOR FINISHES

a New VERTICAL HYDROHONER

A High Production Vertical Type Hydrohoner

Diameter of Work . . . ⅛" to 2".

Spline Driven Head Reciprocating Stroke . . . 15".

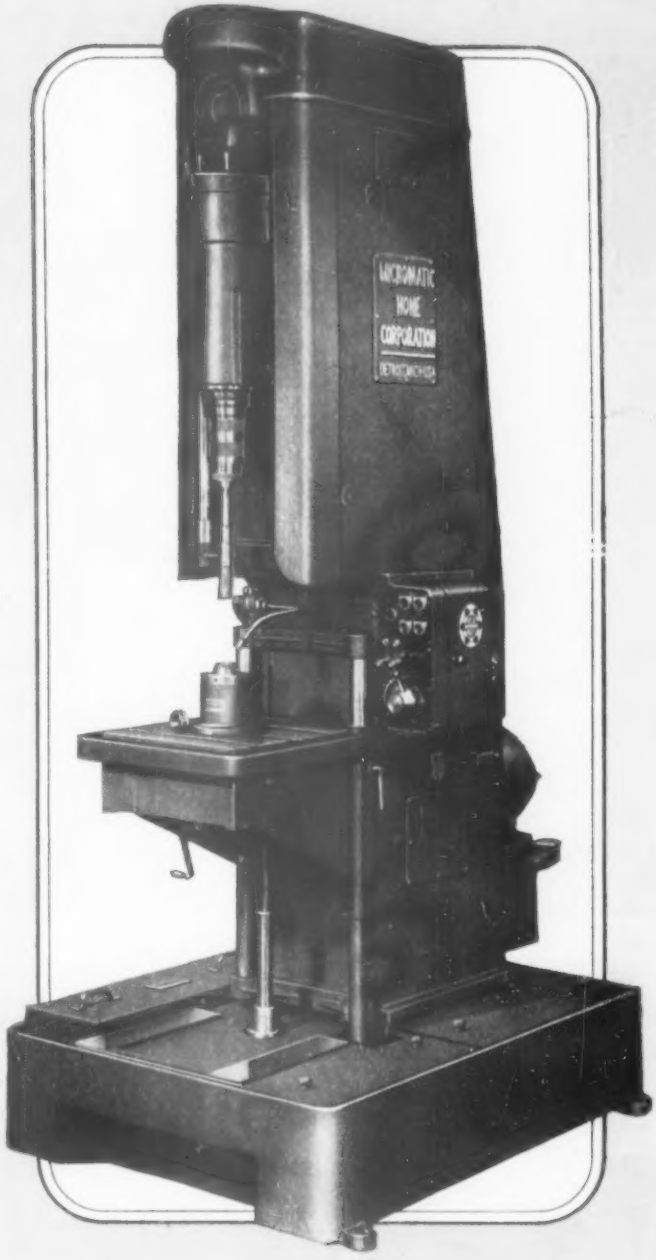
Spindle Oscillating Stroke . . . 0 to ⅛".

Centralized Hydraulic Operating Control. Panel provides easy operation—fast production. Hydraulic tool expansion assures uniform pressure and cutting rates for fast precision work.

Other features are—hydraulic timer—full ventilated hydraulic oil tank of 60-gallon capacity mounted in base.

Also available with 3-speed transmission, rising screw table, electric timer, special coolant filter, and special coolant refrigeration.

Available for normal prompt delivery.



MICRO MATIC

Micromatic HONE CORPORATION

DETROIT 4, MICHIGAN

Finishing Time Cut from 6 HOURS to 1 HOUR with MATTISON GRINDER

Cross Head Guide previously hand scraped in 6 hrs. NOW GROUND in 1 hr. Greater accuracy provides additional time saving in assembly department due to better fit.

ASSEMBLY TIME ALSO CUT DUE TO MORE ACCURATE FIT

● At the Skinner Engine Company, grinding has considerably reduced time on a variety of jobs formerly hand scraped—One example is shown in the photo and sketch above.

The cross head guide was formerly hand scraped and required 6 hrs. Now, with their Mattison Grinder, the piece is finished in 1 hour, the scraping operation has been eliminated, and extremely accurate results obtained. In fact, as a result of this accuracy, the assembly department reports that they are also saving time due to the better fit.

In many other plants, Mattison Grinders are taking on jobs previously finished by other methods — cutting time, helping speed up production and providing fine finish and accuracy to close limits.

For further data, write for free set-up book or send in your sketch or blue print, and we will gladly furnish time estimates.

Write for free set-up book containing further examples, showing how others have reduced time and increased production with Mattison Grinders.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

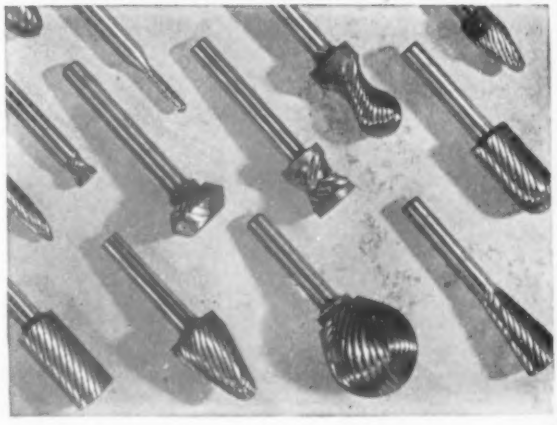
SEVERANCE DISC CUTTERS SPEED FINISHING OF PLASTICS

When it comes to finishing moulded plastic parts, you can't beat Severance Cutters. One efficient installation is shown here. A Severance rotary disc cutter mounted on a spindle with an adjustable table allows perfect finishing of the rough edges with amazing speed.

Severance disc cutters are made of High Speed Steel, in a wide range of sizes. Their teeth are cut in a staggered pattern which produces a shearing cut and thus eliminates chatter.

If you are having difficulty in finishing any manufactured parts, send us samples and our Engineers will design cutters to solve your problems.

Severance complete line of "Carbide" Midget Milling Cutters are now available.

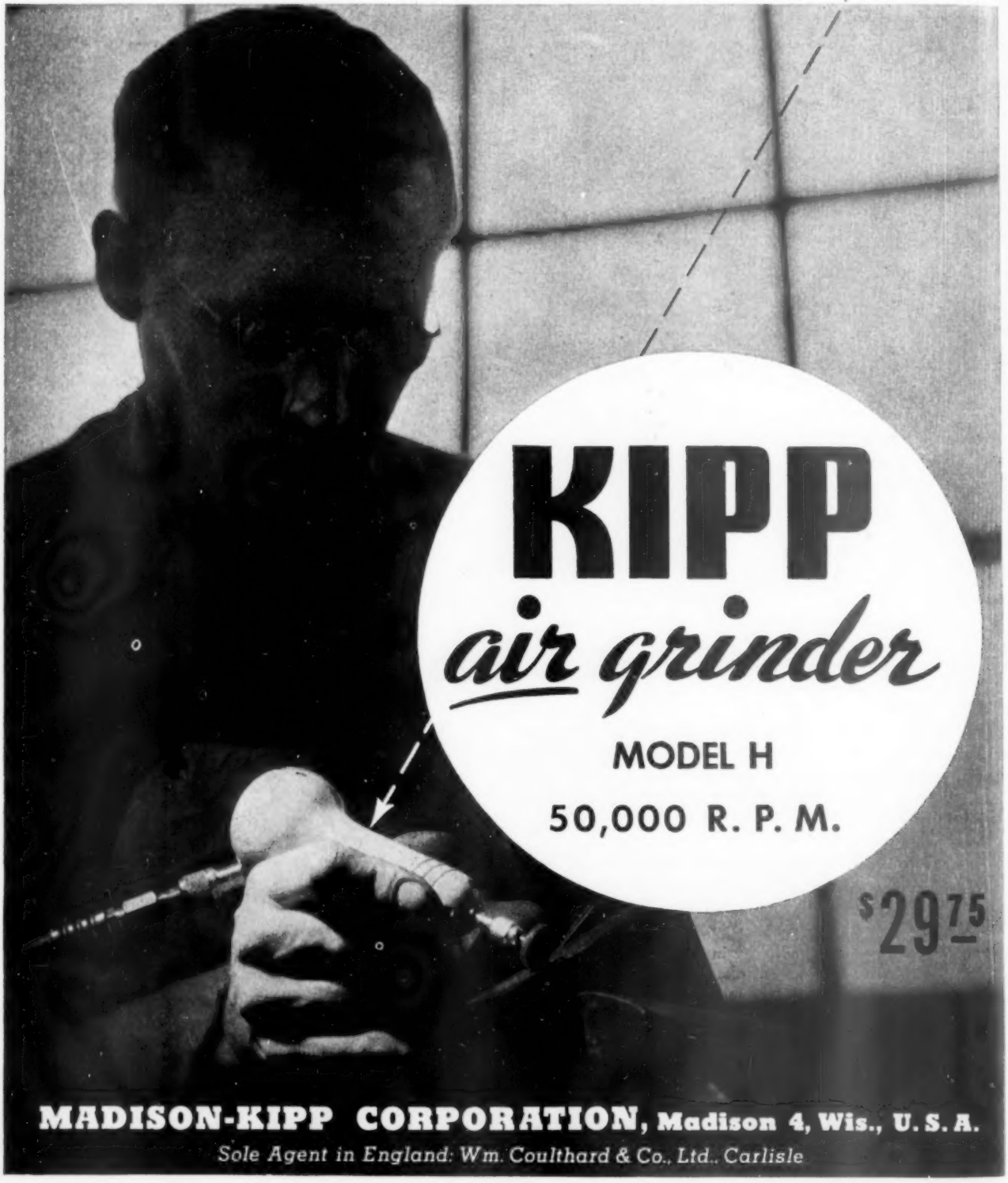


Severance

SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN.
PLANTS IN LONG ISLAND CITY, N. Y.; DETROIT, MICH.; FORT WAYNE, IND.; CHICAGO, ILL. AND LOS ANGELES, CAL.

Developed by Practicing Toolmakers at **MADISON-KIPP**

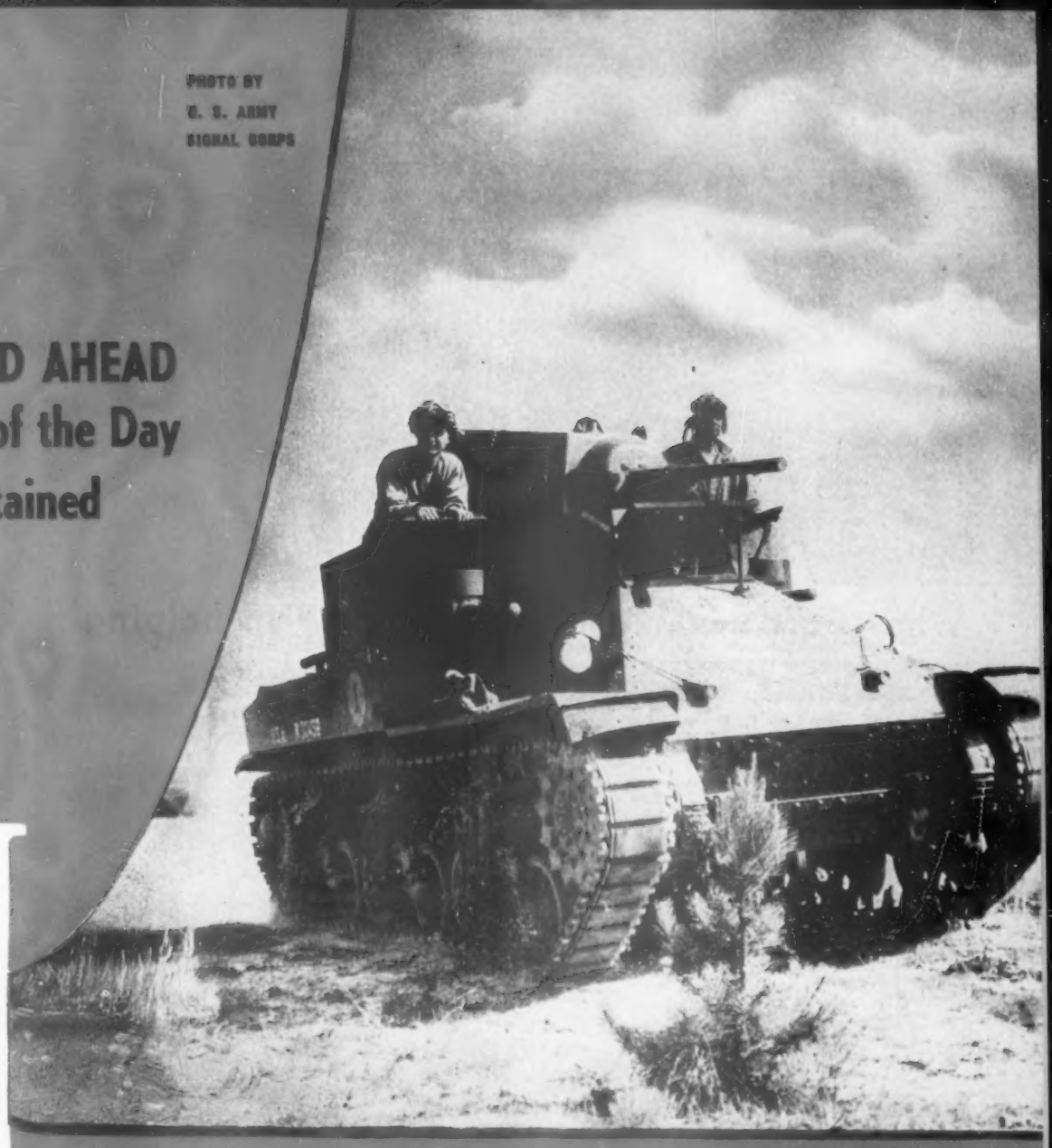
Every toolmaker, every tool crib, every machine shop and thousands of production jobs need a Model H, K or VT Kipp Air Grinder or all three of them. Because of expanded facilities the delivery position on high ratings has been measurably improved. Accessories in reasonable quantities can usually be shipped out of stock. Madison-Kipp Air Grinders were developed by practicing tool makers so they are practical. They usually pay for themselves on a single job. Madison-Kipp Corporation, 209 Waubesa Street, Madison 4, Wisconsin, U. S. A.



MADISON-KIPP CORPORATION, Madison 4, Wis., U. S. A.

Sole Agent in England: Wm. Coulthard & Co., Ltd., Carlisle

PHOTO BY
U. S. ARMY
SIGNAL CORPS



FULL SPEED AHEAD
The Order of the Day
is being attained
with.....

P&J

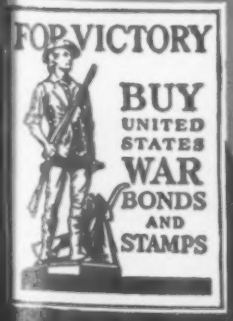
Automatic CHUCKING EQUIPMENT

Wherever the call has come for production and still more production in the great metal working Arsenals of Democracy, the answer has been universally the same—more parts in less time have come rolling off production lines.

P&J efforts to attain higher productivity than ever before have been two-fold—first in building a vastly increased number of Automatic Chucking Machines and second in developing tooling for the users of these machines to achieve remarkable results in output per machine. Time schedules, seemingly impossible to attain, are being met with outstanding success.

Not content with even these attainments, P&J engineers are constantly bettering performance by leaving no stone unturned in tooling which has any possible chance of clipping seconds from the time of machining operation.

The POTTER & JOHNSTON MACHINE CO., *Pawtucket*, R. I.



When Uncle Sam needs more tanks—give them to him! With MORE WAR BONDS

What part will machine tools play in helping

to feed this hungry belly?

Here stands a souvenir of War—a silent, implacable challenge to the meaning of our words . . . Here stands *want*.

A grim reminder that we must not waste food now—that we dare not complain—it also says, as no words could, that part of the victory we're fighting for can only be won with plowshares.

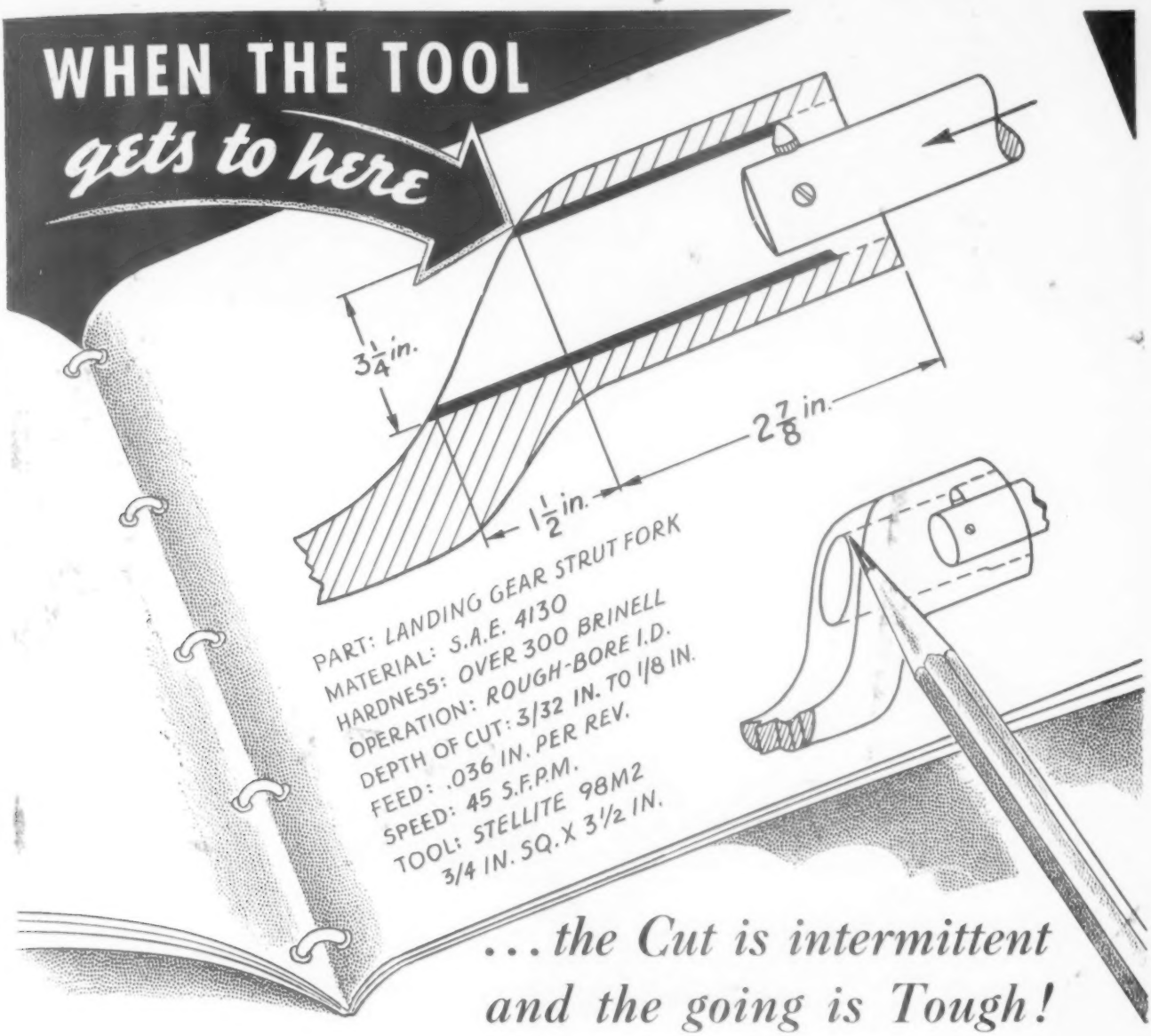
What part will machine tools play? The greatest part in history. For there is scarcely an essential to civilized living today that does not stem from a handful of basic precision machine tools . . . from the barest necessity, a loaf of bread, to the most intricate and wonderful machines which help men think, to search and to know.

And one of these machine tools—the internal grinding machine—is essential to the creation of literally *everything* that will make this world a better place in which to live, after this war is won.

BRYANT

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

WHEN THE TOOL *gets to here*



. . . the Cut is intermittent and the going is Tough!

Rough-boring the I.D. of aircraft landing-gear strut forks of over 300 Brinell hardness . . . at the speed, feed, and depth of cut required to maintain schedules . . . is a severe test of the high-production qualities of cutting tools. This is particularly true during the 1½ in. of intermittent cutting, as sketched above.

Stellite 98M2 tools are standard on this job because they do the work in minimum floor-to-floor time, and at low cost per piece machined.

On many other steel machining jobs where a high rate of metal removal is required, Stellite tools are maintaining production schedules at low machining costs.

Write for the Stellite 98M2 Tool Price List. It describes the properties and available forms of Stellite standard tools. Information on Stellite *special* tools can be obtained from any District Office.

BUY UNITED STATES WAR BONDS AND STAMPS

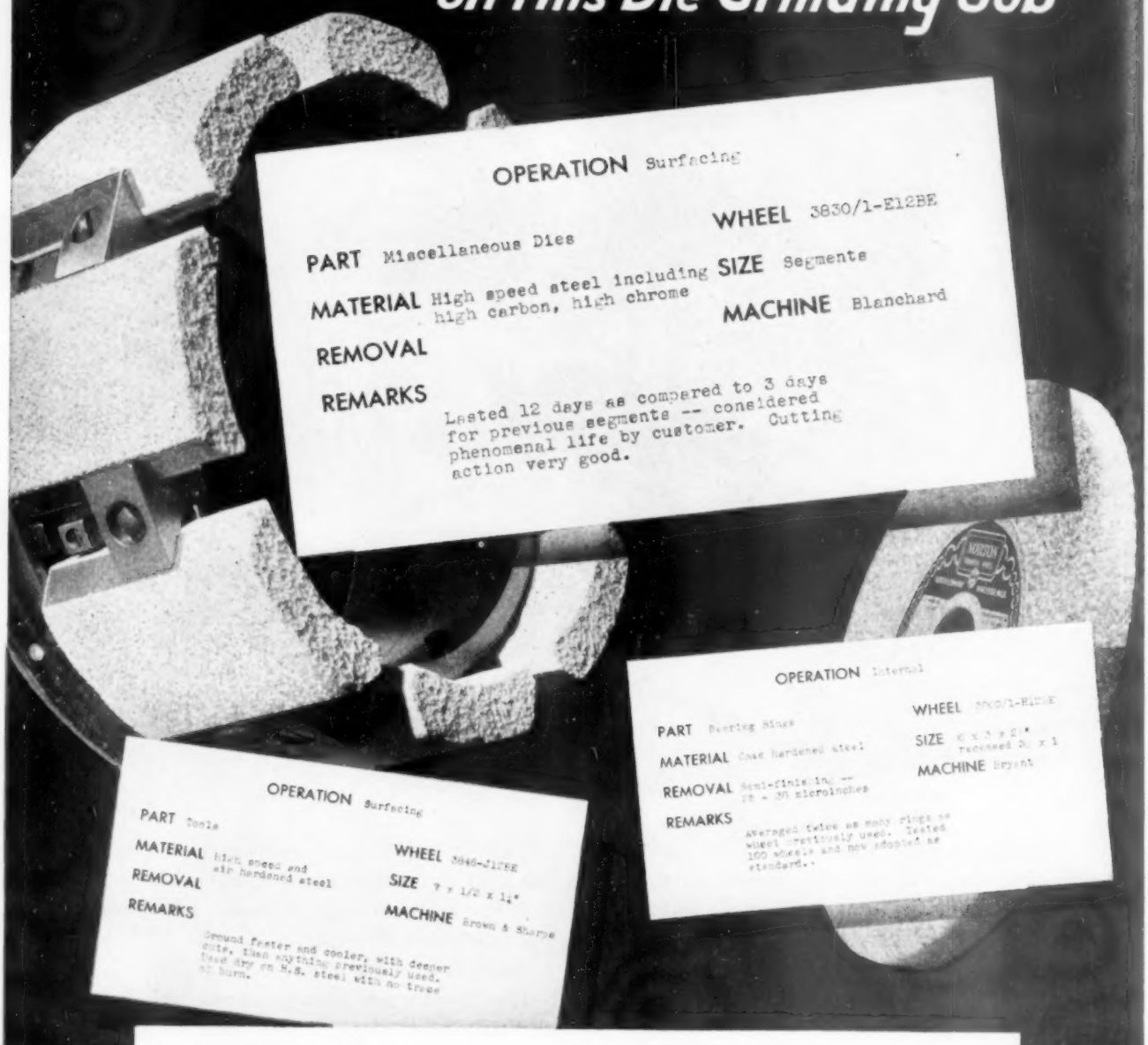
STELLITE
Reg U S Pat Off

HAYNES STELLITE COMPANY
Unit of Union Carbide and Carbon Corporation
New York, N. Y. UCC Kokomo, Indiana
Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

"Stellite" is a registered trade-mark of Haynes Stellite Company.

400% LONGER LIFE *using* Norton OPEN STRUCTURE Segments on this Die Grinding Job



OPERATION Surfacing

PART Miscellaneous Dies

WHEEL 3830/1-E12BE

MATERIAL High speed steel including high carbon, high chrome

SIZE Segments

MACHINE Blanchard

REMOVAL

REMARKS Lasted 12 days as compared to 3 days for previous segments -- considered phenomenal life by customer. Cutting action very good.

OPERATION Surfacing

PART Tools

MATERIAL High speed and air hardened steel

WHEEL 3848-J12BE

REMOVAL

SIZE 7 x 1/2 x 1¼"

REMARKS

MACHINE Brown & Sharpe

Ground faster and cooler, with deeper cuts, than anything previously used. Used dry on H.S. steel with no trace of burn.

OPERATION Internal

PART Bearing Rings

WHEEL 3860/1-H12BE

MATERIAL Case Hardened steel

SIZE 6" x 3" x 2" recessed 2½" x 1

REMOVAL Semi-finishing — 25 - 30 microinches

MACHINE Bryant

REMARKS Averaged twice as many rings as wheel previously used. Tested 100 wheels and now adopted as standard.

The outstanding performance of Norton OPEN STRUCTURE products—both grinding wheels and segments—is attested by many reports like these in the Norton engineering files. If you have jobs where extra coolness of cut is desirable or where the stock removal is especially high Norton OPEN STRUCTURE products may be the answer.

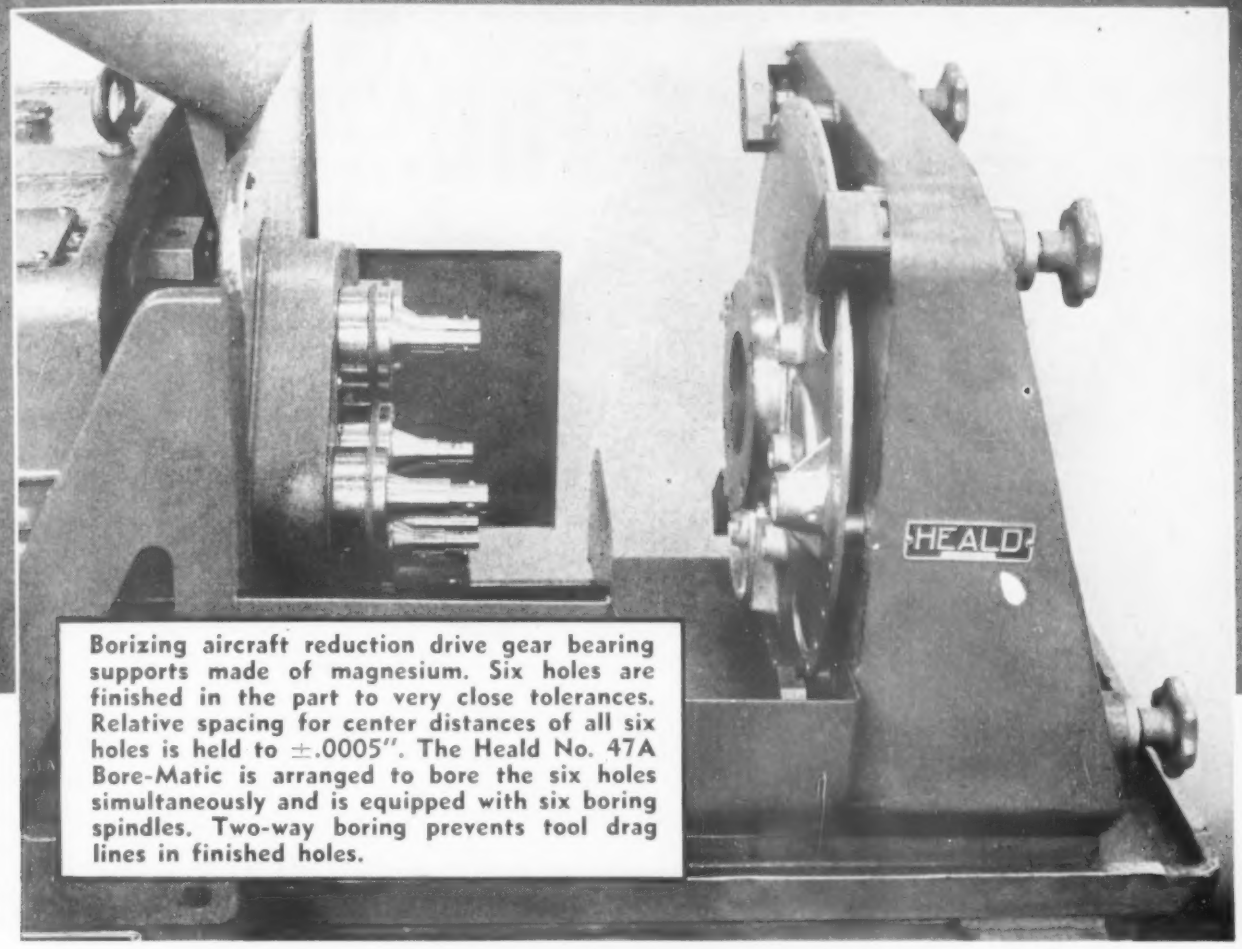
NORTON COMPANY, WORCESTER 6, MASS.

W-949

NORTON ABRASIVES

The Solution

TO MACHINING POST-WAR LIGHT-METALS . .



Borizing aircraft reduction drive gear bearing supports made of magnesium. Six holes are finished in the part to very close tolerances. Relative spacing for center distances of all six holes is held to ±.0005". The Heald No. 47A Bore-Matic is arranged to bore the six holes simultaneously and is equipped with six boring spindles. Two-way boring prevents tool drag lines in finished holes.

Today's precision *BORIZING* of Aircraft Parts

In aircraft plants, everywhere, Heald Bore-Matics are boring, turning, facing and grooving hundreds of light metal parts to precision tolerances . . . with a finish measured in micro-inches. The same Heald "know-how" that gave the aircraft industry precision finished at mass production speeds will give post-war manufacturers maximum precision and production in machining light metal alloys.

The same engineering organization that designed and developed means and methods for accomplishing the impossible on complicated war time products are available to you for today or tomorrow's problems. Make this department part of your organization.

Partial List of BORIZED Parts

- Bases
- Bearing Housings
- Camshaft Housings
- Covers
- Cylinder Heads
- Crankcase Sections
- Front Covers
- Gear Boxes
- Gun Turret Saddles
- Gyro Pilot Servo Bodies
- Instrument End Shields
- Magneto Housings
- Oil Pump Bodies
- Propeller Shaft Plugs
- Reduction Gear Cases
- Regulator Housings
- Speed Reducer Housings
- Supercharger Gear Casings
- Valve Housings
- Valve Tappet Guides

The Heald Machine Company Worcester, Mass., U.S.A

For More Precision Faster bring your problems to Heald

Racine Announces

2 New HARD CHROME TOOL PLATING FINISHES

RACINE
Lundbye Process
Chrome
GIVES TOOLS
300% LONGER LIFE

RACINE
Tri-Chrome
RECLAIMS
VITAL PARTS AND TOOLS

Conservation of machinery and cutting tools has been, and continues to be, of vital importance to the successful prosecution of the war. Probably no other single factor has contributed so greatly in the campaign to salvage tools and machine parts . . . to lengthen tool life . . . as has hard chromium plating. "Tri-Chrome" a recent Racine development, is being widely employed to build-up worn tools, not only to their original dimensions, but to impart amazing new wearing qualities. Now Racine broadens its scope of service to war industries still further by offering the much talked about Lundbye Process of flash plating tools with chrome .0000167" thick, to give them up to 300% longer life. Phone Prospect 1232 for full information on these two revolutionary processes and how they can be of aid to your business.

Racine Plating Company

538 FOURTH STREET, RACINE, WISCONSIN

Engineering Representative:

METAL FINISHING SERVICE, 333 N. MICHIGAN AVE., CHICAGO, ILL.

Cutting oil *News* letter

Practical suggestions from the field on how cutting oils and coolants are being used by midwest machine operators to lick tough wartime jobs.

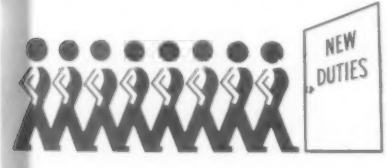
JANUARY, 1944

How longer tool life was obtained in making 250 lb. "practice" bombs

Operations by a stamping company on 250 lb. "practice type" bombs included drilling, reaming, tapping of the nose, cutting off tail end, and chasing an internal thread. Several oils failed to do the job right. Then the operator switched to Stanicool H. D. Soluble Oil (6 to 1 mixture); said it not only produced a better finish, but gave much longer tool life.

Bothered by Buildup on Dies? This was a real problem to a northwest manufacturer . . . on the male die on a deep draw job (6 in. deep) using 26 gauge steel sheets. Two parts Stanostamp "C" to one part water applied by swab ended this problem; also gave longer tool life at reduced cost.

Released 8 Men for Other Plant Work.



In producing 90 mm. anti-aircraft shells, a wrench manufacturer bumped into two headaches: (1) Use of high grade cutting oil at high surface speed and depth of cut caused excessive smoke, made parts too hot to handle. (2) Discoloration of the copper bands kept eight men busy buffing them. Working with plant operators, a Standard Lubrication Engineer selected a special soluble oil for this job. Last report was: perfect work coming through . . . no more rejects . . . the 8 men released for other work in the plant . . . ordnance inspectors enthusiastic.

Didn't ask for extra tool life but got it . . . as a bonus! The main idea in this plant was to lick the twin problems of 10% rejects and breaking along the edges when stamping radiator fins. Variation in hardness of material was the root of the trouble . . . which completely disappeared after changing over to Acme Base Oil Extra Heavy mixed 1 to 6 with paraffine oil. And to top it all off, a 40% increase in tool life has been secured.

How to Prevent Staining on Aluminum After Machining. Here's a practical suggestion that will interest many operators handling aluminum parts. In order to get away from staining and deposits on aluminum after machining, a battery and parts maker tried out a number of cutting oils. Final report is that Stanicut 62 FC was the only one to give full satisfaction. It is now standard for this operation.

OIL IS AMMUNITION . . . USE IT WISELY

World's Largest Planer Takes 6 Cuts At Once. A rolling mill and foundry company recently installed what was said to be the largest planer in the world. It has a table weighing 75 tons, carries a load of 300,000 lbs., takes six cuts at one time. Six barrels of Stanolex No. 31 were placed in the system for dependable lubrication.

Army Inspectors Give Entire Approval. A farm machinery manufacturer, in recently converting to war production, found it difficult to secure approval of finish and cleanliness of parts for plating after machining and tapping SAE 4150 steel. They started using Premier Cutting Oil No. 110 about 5 months ago, and army inspectors have given entire approval on workmanship ever since. More ease in cleaning parts for plating with this oil was a plus advantage.

When You Bump Up Against Special Cutting Oil Problems

• If you are running into trouble in handling war work, and find it tough to get the necessary accuracy, finish, and tool life on converted machines . . . or if you have other perplexing machining jobs that a more efficient application of cutting oils may help answer . . . call in a Standard cutting oil specialist. Phone or write Standard Oil Company (Indiana) office, or 910 S. Michigan Ave., Chicago, Ill., for the Engineer nearest you. In Nebraska, contact any Standard Oil Company of Nebraska office.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICAT

Green Help produces

More, Faster with Apex Safety

Friction Tapping Chucks!

Even inexperienced operators work *faster* and *better* with Apex Safety Friction Tapping Chucks.

These chucks minimize tool breakage because they practically eliminate the hazard of overloading. Taps work safely, accurately, at top speeds on through or bottom holes.

Chucks are easily adjusted for different sizes of taps and, once adjusted, maintain proper tension over long periods. End thrust set up by tapping or pressure exerted by operator on spindle does not affect friction setting. Multiple friction discs have large area and long service life.

Use these chucks on reversible drill presses, radials, handscrews, etc., and save cutting tools. Catalog No. 14 on request.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

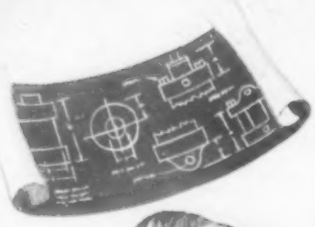
Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft Universal Joints, Plain and Universal Joint Socket Wrenches.

PLAN FOR TODAY AND TOMORROW WITH T-J FOR *Tough Jobs!*

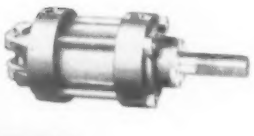
● Men responsible for *efficient production* in all types of industrial plants for a quarter century... have found T-J products "tops" for Tough Jobs!

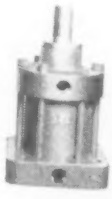
Whether it's a job for Rivitors... hydraulic cylinders ...air cylinders... cutters... Clinchors... or air controls... you can count on T-J for unbeatable efficiency, accuracy and dependable performance! All T-J products built to precise standards of manufacture... rigidly inspected... backed by practical-minded experienced engineering. In planning a better production set-up for better products... specify T-J Quality! Write for bulletins.

The Tomkins-Johnson Co., Jackson, Mich.



HYDRAULIC CYLINDERS





DIE SINKING MILLING CUTTERS

CLINCHORS

AIRCRAFT RIVITORS

AIR CYLINDERS

AIR CONTROLS

T-J

TOMKINS-JOHNSON

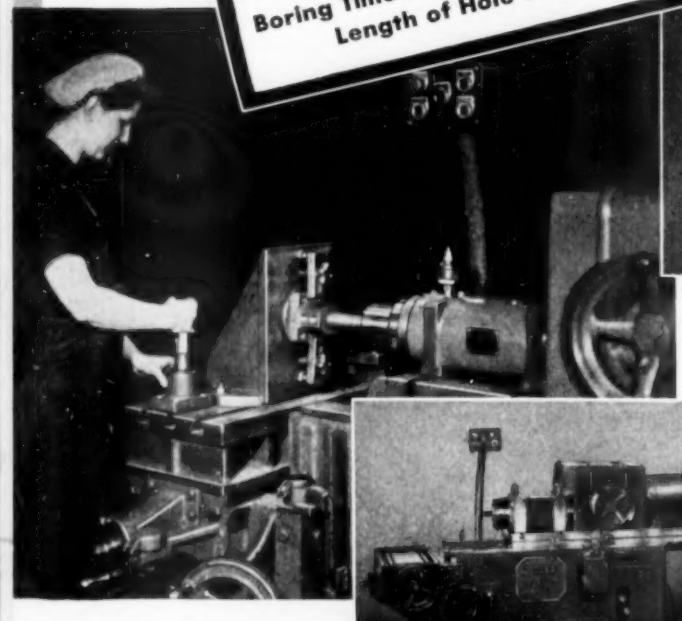
RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

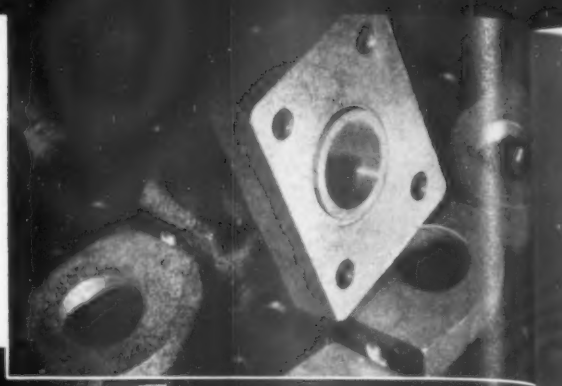
Accuracy Held to $\frac{+.0005}{-.0000}$''

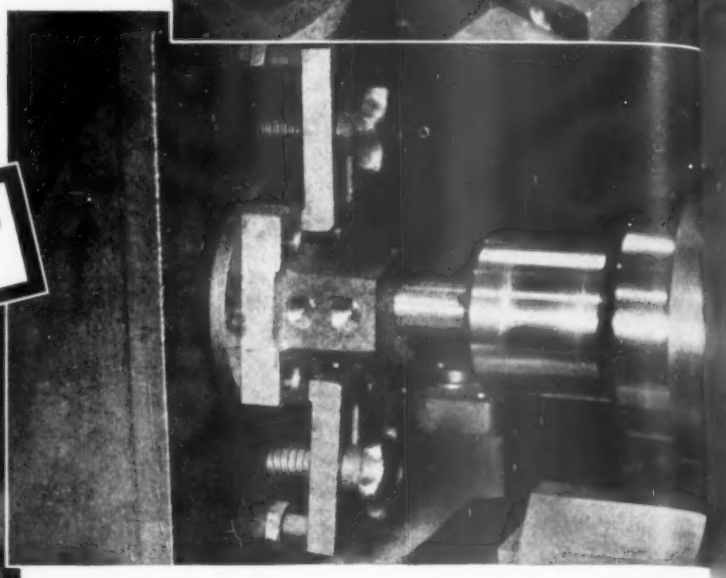
in Finish Boring Flanged Tool Holders on *Knee-Type*

STOKERUNIT SIMPLEX PRECISION BORING MACHINE

Boring Time 2¼ Minutes Per Hole
Length of Hole 3 11/32''

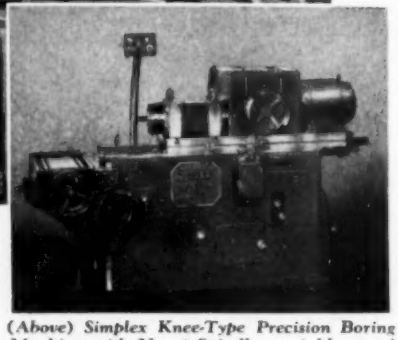






◀ *(Left) Automatic precision operation—girl worker maintains accuracy and finish in production.*

▲ *(Above) Work piece is accurately held in simple fixture with hand clamps.*



(Above) Simplex Knee-Type Precision Boring Machine with No. 4 Spindle, variable speed spindle drive and turret stop for table.

In precision boring the hole in this flanged tool holder for turret lathes, the Knee-Type Stokerunit Simplex Precision Boring Machine maintains extremely close tolerances in diameter and location. High finish is also assured.

Boring Data: Dia. of finish bore is 1.500'' (+1.5005'' −.0000''). Length of bore is 3 11/32''. Work piece accurately located in fixture on counter bore flange. Finish boring time is 2¼ minutes each. Spindle speed 850 r.p.m.; feed 1½'' per minute. Approximately 150 pieces are bored per sharpening of the tungsten carbide cutters.

Versatile *Universal* Performance

This manufacturer of machine tools is using the Knee-Type Stokerunit Simplex Precision Boring Machine for a wide variety of precision boring operations. For example, boring a number of holes in various locations on a multiple tool head is accomplished with maximum efficiency on this machine. Knee is adjustable vertically—table laterally. Built-in dial gauges, graduated in ten thousandths, with precision length bars, permit accurate table positioning. Rapid traverse of spindle unit provides quick approach to cutting position and return at end of machining cycle.

To Solve Your Precision Boring Problems . . . get the complete Stokerunit story today. Over 25 models of Simplex Precision Boring Machines cover practically the entire range of precision boring applications. They are available in mechanical and hydraulic feeds, with single or multiple spindles, for either short-run or production work.

For specific recommendations, send blueprints of parts with production requirements. No obligation.

Write Today for these two booklets covering details of our entire line of Simplex Precision Boring Machines.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHI

4528 WEST MITCHELL STREET • MILWAUKEE 14, WISCONSIN

Increased Production from Lathes Built to Produce

● The Sidney Continuous Tooth Herringbone Geared Head is not only distinctive in design but is based on sound engineering principles. The Headstock, while only one of the component units of the lathe, is the unit that merits the purchaser's most serious consideration.

Illustration shows the exclusive Sidney Headstock transmission, providing 16 selective spindle speed changes, with all the gears in constant engagement, and speed changes secured by means of sliding clutches of the internal and external involute tooth type operating on multiple spline shafts. Precision, rigidity and stamina are built right into this unit resulting in a smooth flow of power, finished work free of tooth marks, minimum of maintenance attention and a definite increase in production.

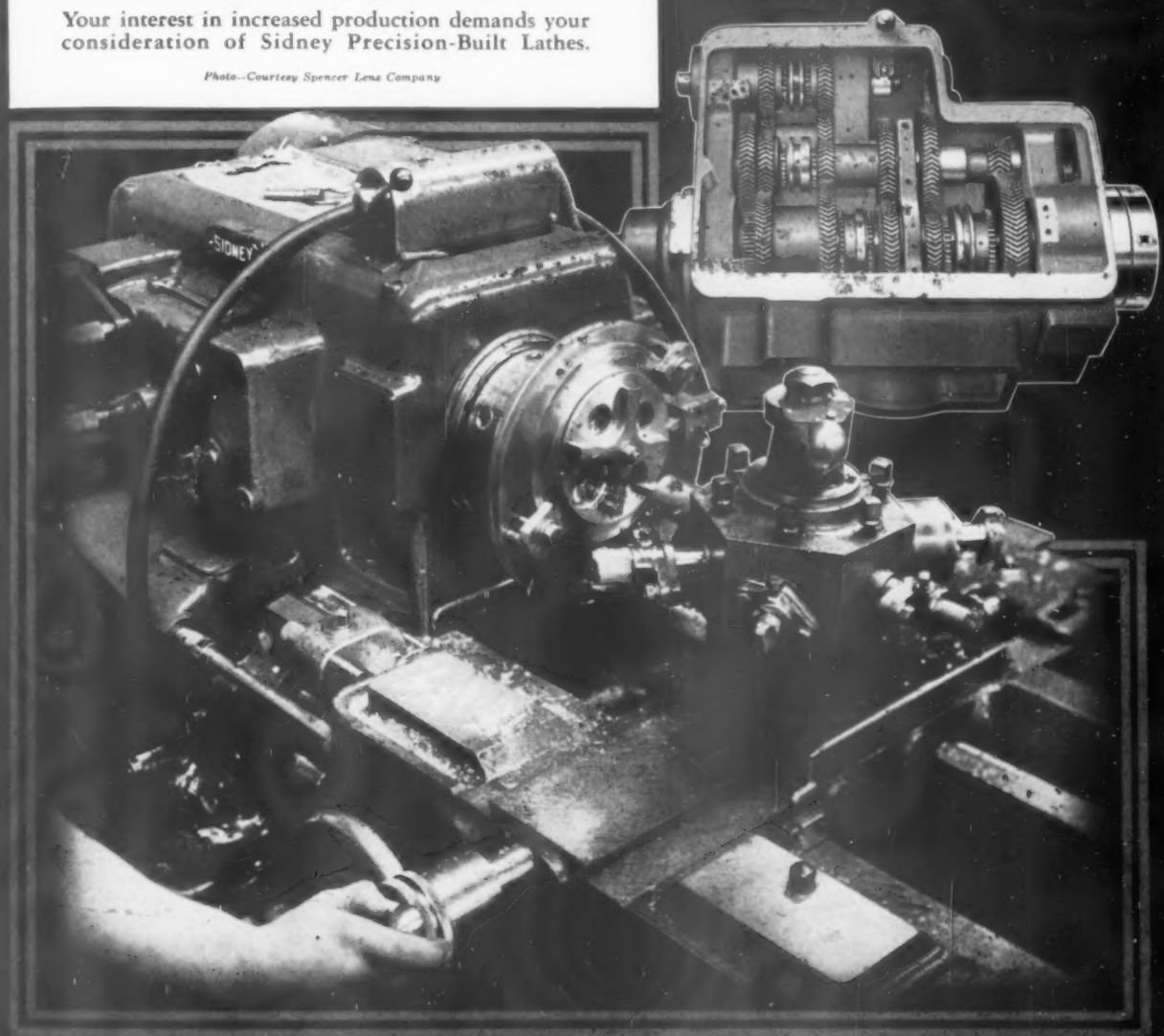
Your interest in increased production demands your consideration of Sidney Precision-Built Lathes.

Photo--Courtesy Spencer Lens Company

SIDNEY

SIDNEY LATHES

with Continuous Herringbone Geared Head



The **SIDNEY MACHINE TOOL** *Company*

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 **OHIO**

Your I S D always was ready – is ready now

Alert to their Country's needs, Industrial Supply Distributors have rendered distinguished service through each of America's major wars during the past 100 years. The Fighting men depend upon the Nation's mills and factories to keep supplies moving to the front lines—the Production men rely upon Industrial Distributors to keep *their* supplies moving up too. Your Industrial Supply Distributor is continually at your call—in war and peace alike. For Cle-Forge High Speed Drills, Peerless High Speed Reamers, and everything else you need to keep your production going—

Telephone your I S D FIRST

C

ARMY NAVY

ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

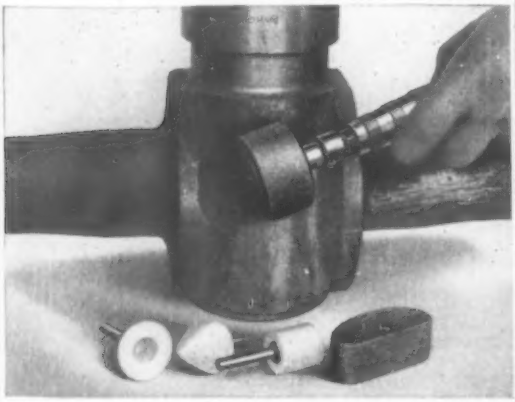
30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6315 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4

Jarvis Flexible Shaft Machines

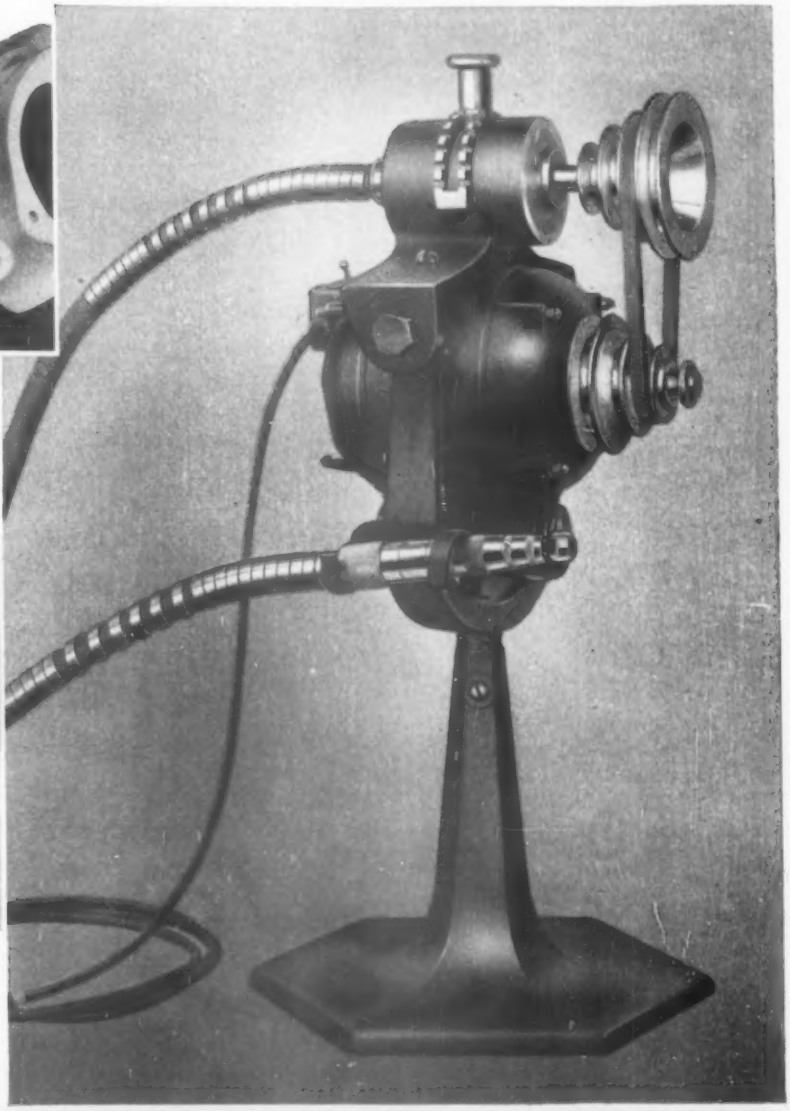
Jarvis Multiple-Speed Flexible Shaft Machines make it possible for the metal craftsman, the finisher, and the cleaner to have a universal tool suitable for rotary filing, sanding, grinding, polishing, and buffing. There are Jarvis Flexible Shaft Machines and Tools that will satisfactorily meet your requirements.

Write for our new catalog MFTI.

Jarvis Flexible Shaft Machines are used extensively in the aircraft engine industry and aluminum foundries; also in mold and metal pattern shops.



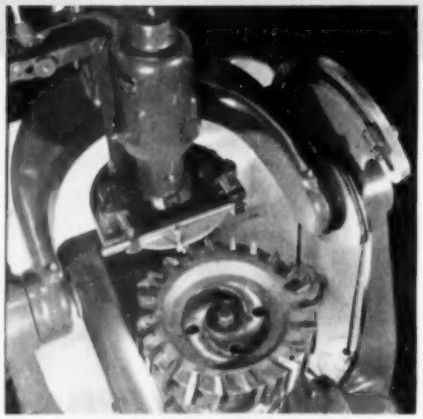
Jarvis Tools are made for efficiency and long life. For use with Jarvis Flexible Shaft Machines, in any finishing or cleaning operation.



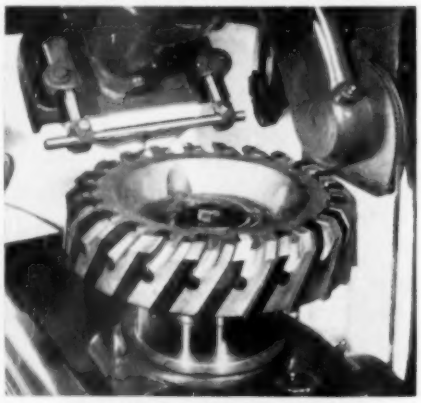
THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

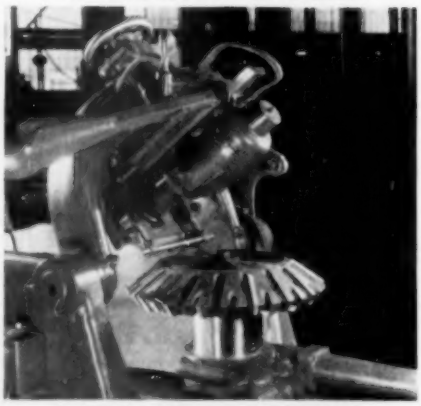
The INGERSOLL CUTTER GRINDER



CONVENTIONAL FACE MILL



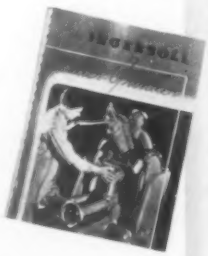
INGERSOLL SHEAR CLEAR



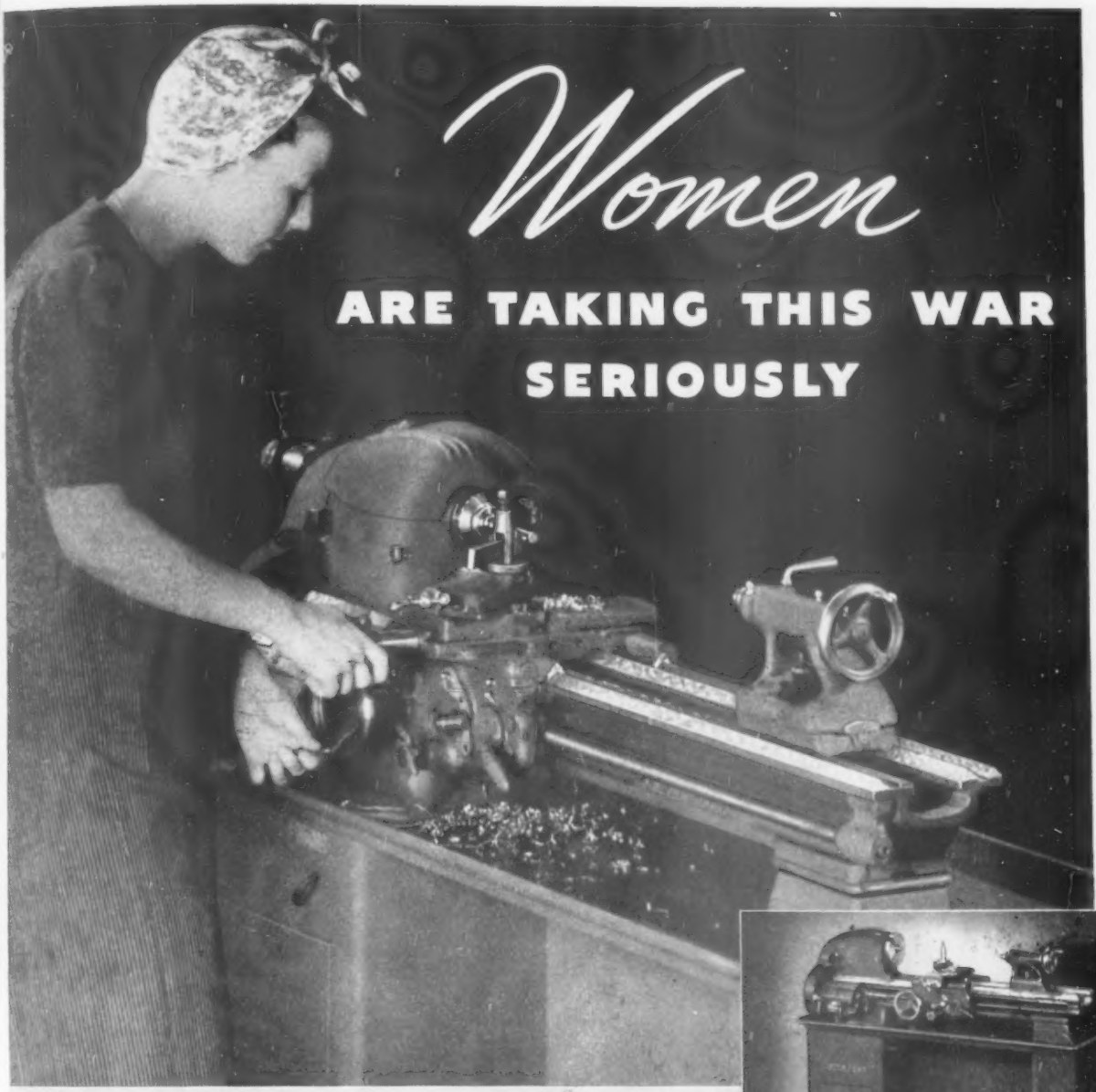
DOUBLE ANGULAR CUTTERS

THE INGERSOLL CUTTER GRINDER is particularly designed for grinding Face Milling Cutters. It grinds at a single setting of the cutter the face, periphery, and corners of cutters from 4 inches to 30 inches in diameter and having a maximum peripheral face of 7 inches. It will also grind solid shank, radius, staggered tooth, and angular inserted blade cutters. It is fast, accurate, and may be operated by the average mechanic. The technique for grinding milling cutters is simple and easily followed when thoroughly understood.

THE NEW MANUAL pictured below shows, through illustrations, the wide range of application of this machine and assists the operator in the best methods of grinding. A copy of this interesting book will be mailed to you upon request.



THE INGERSOLL MILLING MACHINE CO. ROCKFORD ILLINOIS



SOUTH BEND LATHES

9" swing, South Bend Engine Lathe

With grim determination thousands of American women are doing their best to fill men's shoes. Eagerly they bend their shoulders to wartime tasks—for no sacrifice is too great if it hastens the return of their men from the fighting fronts.

In hundreds of vital war plants, women are operating South Bend Lathes with surprising results. On all kinds of jobs, they have kept up production and maintained established standards of precision. In some factories whole batteries of South Bend Lathes are humming under the guidance of feminine hands.

Since World War I, women operators have preferred South Bend Lathes. Their nimble fingers find the convenient controls well suited to their sensitive touch. They like the fully enclosed design. And, most of all, they appreciate the ease of operation that prevents fatigue and makes the workday seem shorter.

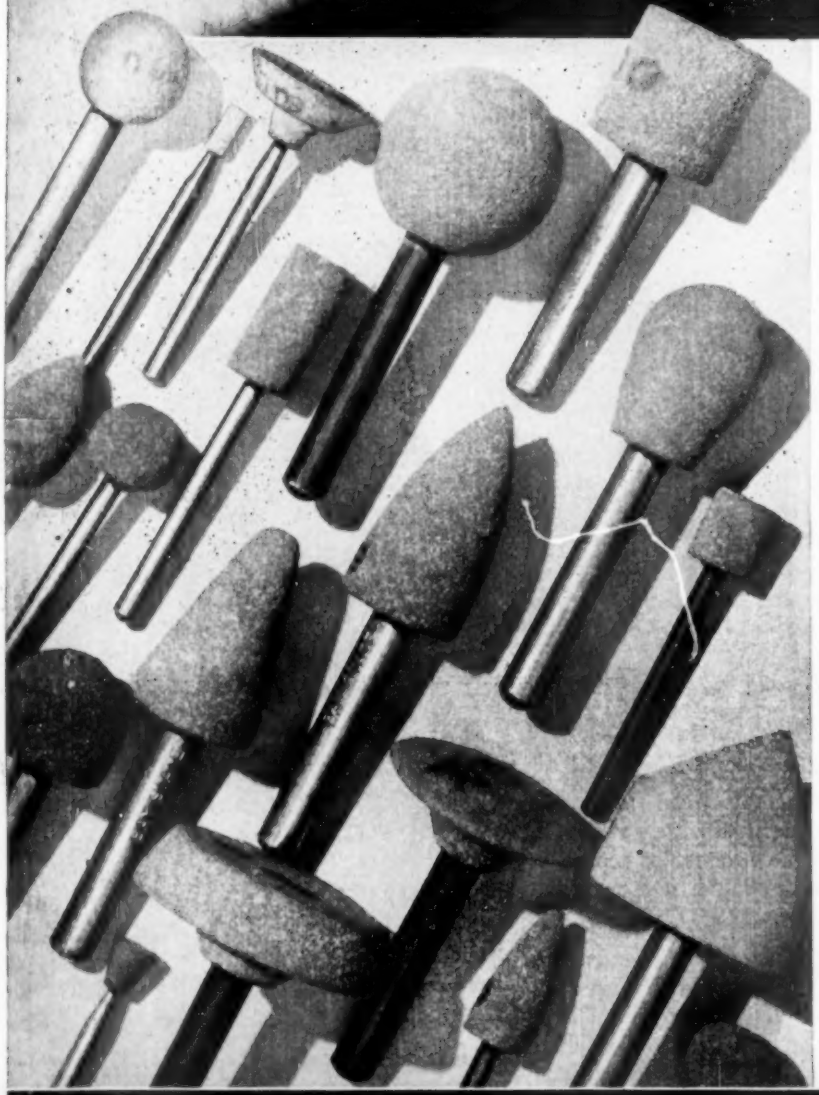
South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″ to 16″ swings, with 3′ to 12′ bed lengths. The Turret Lathes are made with 9″ and 10″ swings. Write for Catalog 100C which describes all sizes and types of South Bend Lathes.

BUY WAR BONDS

SOUTH BEND LATHE WORKS

Lathe Builders for 37 Years
SOUTH BEND 22, INDIANA

A little touch MEANS SO MUCH!



There are several honest-to-goodness reasons why BAY STATE wheels and points are preferred for those innumerable, fussy jobs on moulds and dies.

1. They are pressed into uniform blanks, assuring grade hardness.
2. They are formed absolutely true on BAY STATE precision lathes.
3. They are ready for immediate cutting action — in a myriad of shapes and sizes.
4. They can be used completely down to the spindle.
5. They will not come off the spindles.
6. They are free from "hard and soft" spots.

Send for illustrated catalog and bulletin containing standard stock and mandrel specifications.

BAY STATE WHEELS of PROGRESS

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

An *Improved* PRECISION TOOL . . . . for Threading to Extra Accuracy at Extra Speed

MURCHEY *Collapsible* MACHINE TAP

Type "B-M"

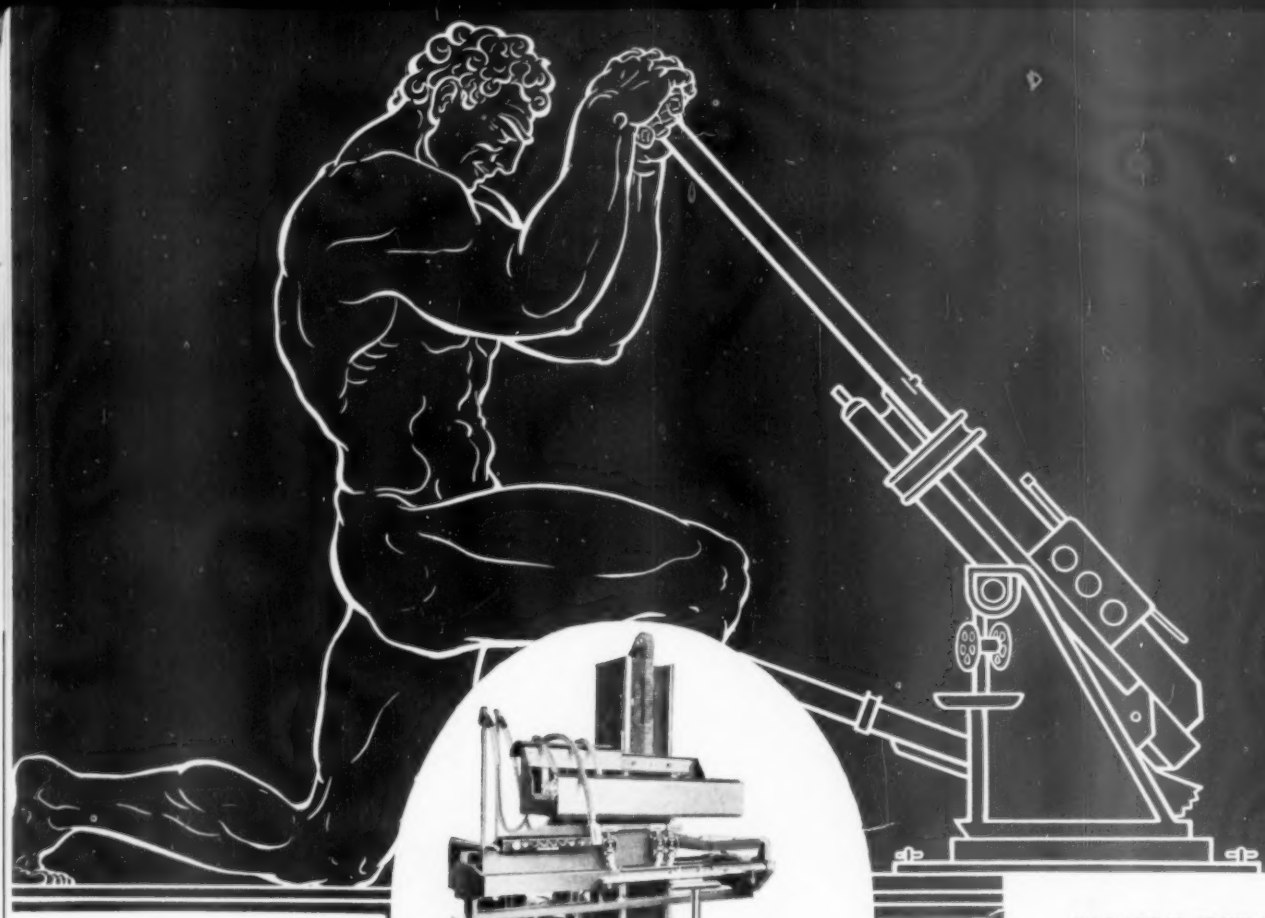
4 WEEKS DELIVERY

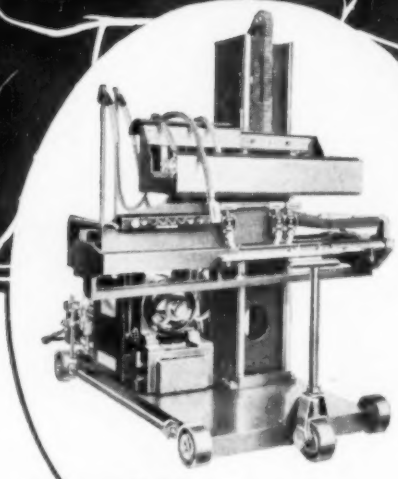
Collapsing mechanism insures instantaneous action. Positive and quick opening action protects work and increases machine productivity. Sturdy—speedy—dependable. Simple to operate. Easy to adjust. Affords greater accuracy of thread length. Write for illustrated booklet on Type "B-M".

WRITE ALSO—*for literature on Type "G" and Type "C-O" Self-Opening Die Heads—and for folders on Murchey Thread Milling Machines, Shell Tapping Machines and Roller Pipe Cutting-off Machines.*

MURCHEY MACHINE & TOOL COMPANY
Dept. T—DETROIT 26, MICHIGAN

MURCHEY





Oilgear furnishes thousands of pounds of pressure to force gun barrels back against recoil, also the rapid reciprocation which enables gun to return to "battery" as in actual firing.

Latest Model Exercise Machine *

Guns get a move-on when Oilgear powers the push

A Gymnasticator, as you might guess, is an exercise machine. But this time it's for the recoil mechanisms of guns—these too have to be tested before they can be trusted. The job of exercising the recoil was formerly done by hand. It took hours and was inadequate. Now it's done with Gymnasticators—under conditions that actually and accurately simulate rapid fire—and the job takes *minutes*.

This too is another success story for Oilgear . . . the Fluid Power system that provides, among other things as in the case of Gymnasticators, tremendous power in small space, with rapid reciprocation. Possibly you need just this . . . *or* steplessly variable speed control . . . *or* hairline accuracy in control of movement . . . *or* force without motion . . . *or* any of a dozen other highly interesting functions for designers of post-war machines. The combination of experience and function which Oilgear engineers and Oilgear systems can bring to you may provide the right happy ending to your story too. Now is the time to find out . . . THE OILGEAR COMPANY, 1308 W. Bruce St., Milwaukee 4, Wisconsin.

*Mfrd. by Jackson Hydraulic Machine Co., Inc., Rockford, Ill.

ARE YOU TRYING TO:

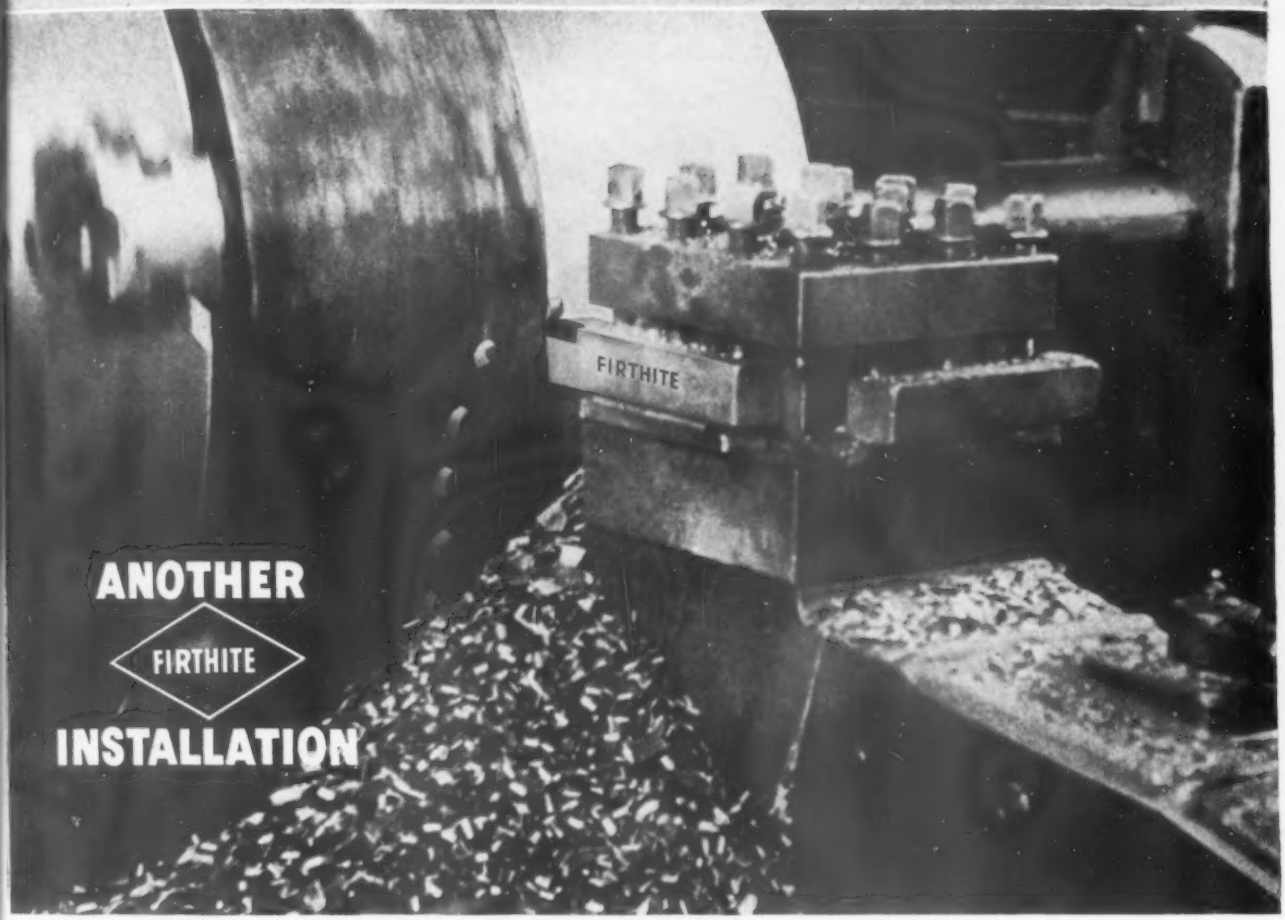
1. Apply large forces through long . . . short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles constant or variable velocities?
4. Obtain extremely accurate control either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions operations or functions?
7. Apply light . . . or heavy . . . forces extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R P M or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed-range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from variable speed input?
14. Obtain full pre-set automatic control elimination of problems of shock, vibration, etc.?

You Need Oilgear!

OILGEAR

Fluid Power

730 POUNDS OF CHIPS PER HOUR!



Simultaneously in **boring** these castings, FIRTHITE Tools take five shocks per second on a severe, interrupted cut.

On **rough turning** this 20″-dia. gray iron casting, with only chuck support, a FIRTHITE Sintered-Carbide Cutting Tool takes a ½″ cut, 0.042″ feed at 170′ per minute—far beyond the capacity of high-speed steel tools.

FIRTHITE cuts clean and free with little pressure at high speeds . . . produces remarkably smooth and even finish. For **super** production, on **any** metal or non-metal, investigate FIRTHITE. Write today for descriptive literature.

ARMY E NAVY

Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

MAKERS OF HIGH-SPEED STEELS, TOOL AND DIE STEELS, AND SINTERED CARBIDES

ASK the opinion of any production man who is using Super Carboloy Tipped Milling Cutters and you'll hear some enthusiastic comments. He will tell you of Super Performance, Super Accuracy, Super Economy.

He will talk about faster milling that decreases the cutting time on some jobs as much as 200%. He'll mention feeds in cast iron and nonferrous materials of .002″ to .005″ per tooth and in steel of .0005″ to .0025″ per tooth at surface speeds of 400 to 800 feet per minute. He will tell you, too, of the greater accuracy that results from these faster speeds because of less work distortion. And when you ask about finishes, he will show you finishes that compare favorably with ground surfaces.

Then ask about Economy. That's when his eyes will *really* sparkle! For the prices on these milling cutters permit their use on short as well as long run jobs. And they are designed to be used for plain milling, slotting or side milling without alteration. Try Super Carboloy Tipped Milling Cutters once and you, too, will say they're "Super." Write today for descriptive folders and prices.

All sizes available from stock for immediate shipment.

OTHER SUPER CARBIDE TIPPED TOOLS *FOR*

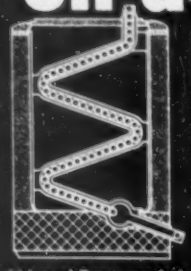
Turning, Facing	Drilling
Reaming	Grooving
Spotfacing	Counterboring
Forming	Shaving
Grinder Rests	Centers and
Wear Parts	Special
Boring	Purposes

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

NOW! METAL CHILLING on a Production Basis



(Above) Parts are fed into the cold chamber on two ring tracks.

(Above) View showing operator placing insert in cylinder block after chilling.

(Right) Standard Deepfreeze Cascade Industrial Chilling Machine with special loading and ejecting mechanism used for shrinking steel valve inserts.

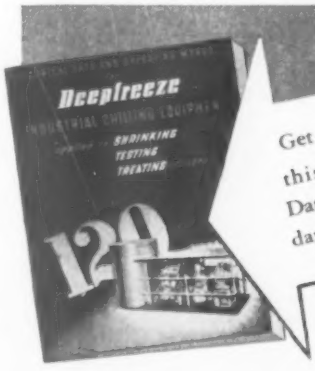
Deepfreeze Industrial Chilling Machine . . . . *saves $3675 per year* When Put on a Production Line for Shrinking Valve Inserts

A prominent automotive manufacturer obtained a total net savings of $3675 per year over dry ice by installing a Deepfreeze Cascade −120° F. Industrial Chilling Machine in his production line for shrinking steel valve inserts. A standard Deepfreeze machine was adapted for production chilling of these parts by adding a special automatic loading hopper just above the cylinder. The hopper revolves under electrical control, and distributes the parts downward to two ring tracks which feed into the top of the freezing chamber. The parts traverse through the track to the bottom, and are fed out through a special device which alternates the ejection of the inserts from either track. This ejector mechanism is foot or manually operated through a plunger by the operator.

By chilling at −120° F. these parts are shrunk .002" for permanent shrink-fit assembly in a motor cylinder block. Production rate is 360 parts per hour, with 360 parts in the machine at one time. The cost of the dry ice method was approximately $4500 per year, as compared to the $175 electric current consumption of the Deepfreeze machine over the same period, plus $650 first year cost of depreciation, and interest on capital.

JOB FACTS

OPERATION—Shrink-fit assembly of steel valve inserts in motor cylinder block.
DIAMETER OF INSERT { 1.515 / 1.516
SHRINK OF INSERT—.002" @ −120° F
MATERIAL—Alloy steel.
HARDNESS—50−60 Rockwell C Scale.
PRODUCTION—360 parts per hour.
FORMER METHOD—Used dry ice in two boxes. Cost approximately $4500 per year.
MACHINE—Deepfreeze Cascade −120° F. Industrial Chilling Machine with special loading hopper and ejector mechanism.



Get complete facts in this new Deepfreeze Data Book. Write today for free copy.

Deepfreeze

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

2311 DAVIS STREET
NORTH CHICAGO, ILLINOIS

Division of Motor Products Corporation, Detroit, Michigan

VERY DIFFICULT INTERNAL FINISHING PROBLEM SOLVED

with the Sunnen Precision Honing Machine!

Too many scrap parts — was this manufacturer's problem. Too many 20 MM steel aircraft gun parts were being rejected because they weren't meeting the tolerance specifications. By the previous method of finishing, parts were often cut oversize, through no fault of the operator, and had to be scrapped.

A consultation with a Sunnen Service Engineer led to the installation of the Sunnen Precision Honing Machine to handle these finishing operations. In the manufacturer's own words — "This machine is going to pay for itself many times over in a short while in saving of scrap parts and time." In addition, he is getting a better surface finish.

The coveted Army-Navy "E" waves over the Sunnen plant —evidence of the important part Sunnen equipment is playing in the war effort.

Consider These Advantages

Wide range—handles internal diameters of .185" to 2.625". Accuracy within "one-tenth" guaranteed — has been held to .000025" on production jobs. Relieves big internal grinders for other jobs. Corrects errors of out-of-roundness or taper caused by previous operations. Facilitates duplication of sizes. Does not require skilled labor. Practical — inexpensive — economical to operate.

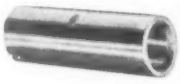
Put Sunnen Honing to work in your plant!

Typical Jobs

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.

Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", sixty per hour.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

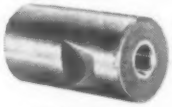
Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

Bearing. A very small part. 2 micro-inch finish necessary.

Cast Iron Valve Stem Guide. ½ to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

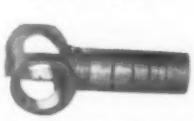
Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.



Shell Loading Die.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Aluminum Aircraft Link "produces high finish without bell-mouthing."



Compressor Yoke. Alignment maintained and better finish produced.

SUNNEN

SUNNEN PRODUCTS COMPANY • 7932 Manchester Avenue, St. Louis, Missouri

Canadian Factory: Chatham, Ontario

LOCKED *positively*

LOVEJOY MILLING CUTTER BLADES

are therefore ideal

when tipped with CARBIDE

The advantages of carbide tipped milling cutters are known to all progressive manufacturers. Of prime importance in choosing the *right* cutter is the consideration that higher speeds, heavier cuts and coarser feeds are encountered.

Lovejoy Milling Cutters, with POSITIVE-LOCKING, carbide tipped blades, are the *right* cutters for these tougher requirements. This is why—(1) tips are backed up with husky steel blades, (2) serrations are on the front of the blade, *not* on the back or locating side, (3) short blades are held as solidly as new blades, so *all* the carbide can be used, (4) housings are precision machined, tough steel forgings, (5) blades are easily, *and positively*, locked, (6) Standard sizes of blades are carried in stock for immediate shipment.

There are standard and special Lovejoy Milling Cutters for every requirement.

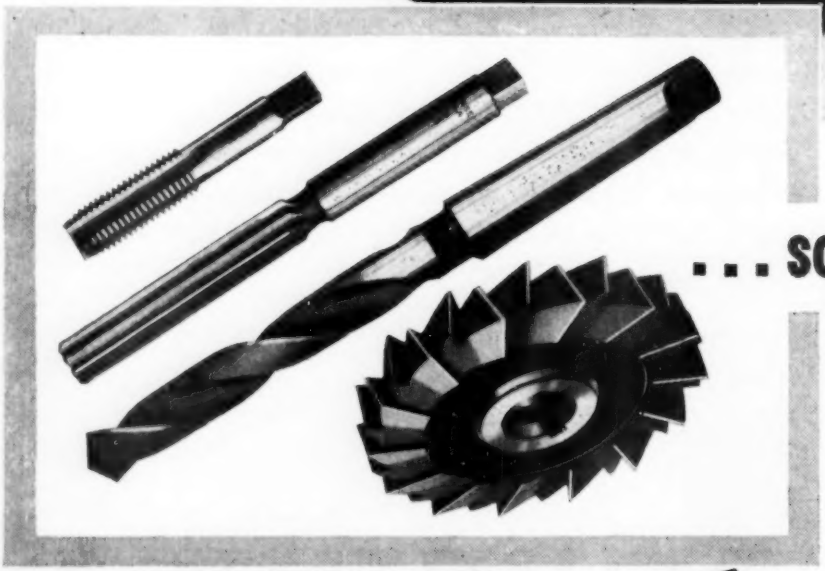
Write for Catalog No. 26 today!

LOVEJOY

TOOL COMPANY, Inc.

SPRINGFIELD, VERMONT, U.S.A.

DEPENDABLE...



...so are Morse Tools

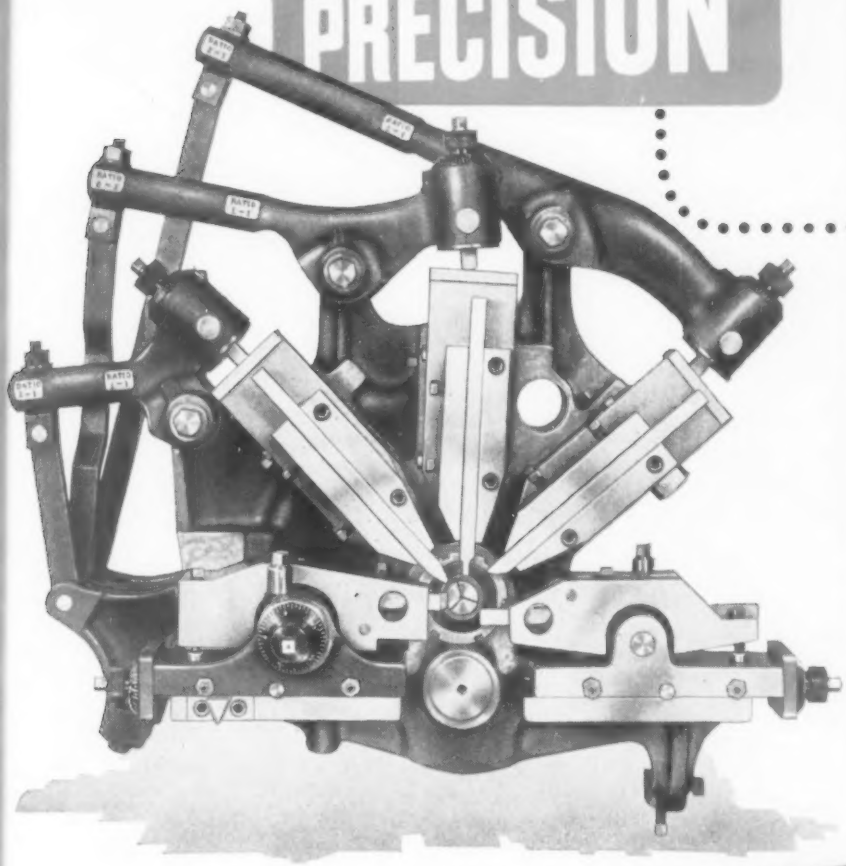
That's Why Morse Tools help to increase production.

Tools are Weapons
— Treat 'em Right!

MORSE THERE IS A DIFFERENCE **TWIST DRILL AND MACHINE COMPANY**
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

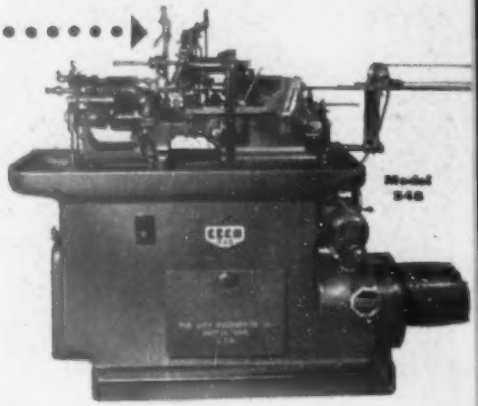
One-Operation PRECISION



CECO

SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES



Highlight Features!

BAR CAPACITY: 3/8" and 1/2"

4 or 5 RADIAL TOOL SLIDES.

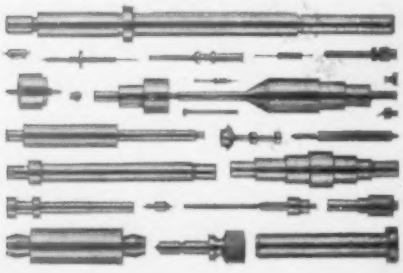
MAXIMUM TURNING LENGTH: 4" with flat cam.

MASTER SPEED RANGER: Varies Spindle speed from 675 to 7500 R.P.M. at the turn of a handwheel.

PRECISION ROLLER BEARING SPINDLE: Always in adjustment.

CONSTANT RISE FEEDING MECHANISM gives extreme feeding accuracy.

Serving some of America's greatest precision-makers, including Norden, Kollsman, Sperry, Bendix and many others, the Ceco Automatic is revolutionizing the mass production of small intricate parts—cutting tool costs, speeding the set-up and producing *one-operation precision work* with amazing economy and efficiency.



THIS BOMBSIGHT PINION SHAFT IS AN EXAMPLE OF CECO'S ONE-OPERATION, HIGH-SPEED PRECISION PRODUCTION

Produced by Ceco *in one operation* instead of three formerly required, and with single tip tooling, thereby eliminating form tools commonly used, is the Bombsight part reproduced above.

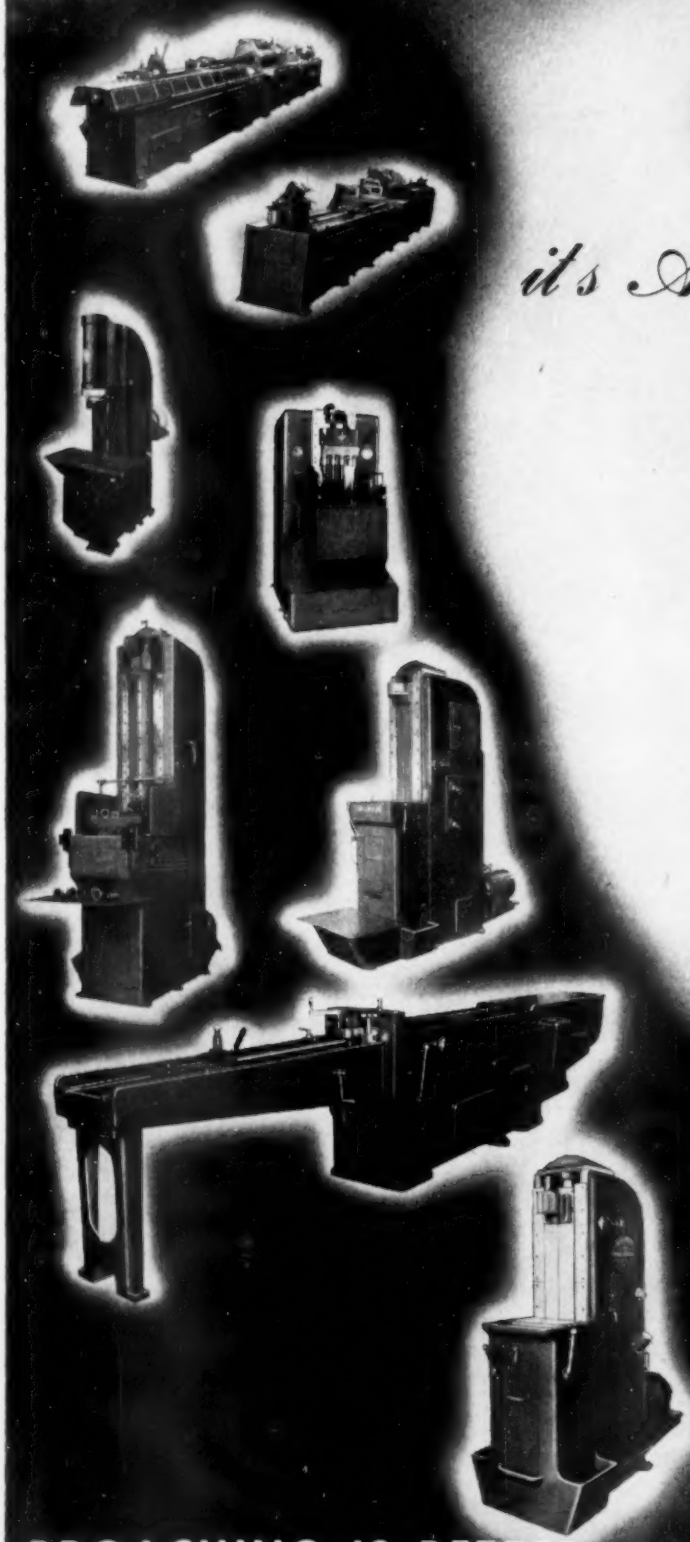
Shown on this page are a few of the hundreds of parts Ceco produced in *one operation* with extreme accuracy and high finish. Odd shapes and multiple diameters, also complicated forms, including tapers, bevels, radii, etc., are Ceco-produced with single tip tools. Result—quick set-up, low cost, and faster high precision production of intricate parts. For information and literature write:

THE CITY ENGINEERING CO.
DAYTON, OHIO

Since 1909, Designers and Builders of Tools, Dies, Jigs, Fixtures, Gages and Special Machinery.

THIS AIRCRAFT ENGINE PLANT NOMINATES

it's All-American Team



So high is the production-with-precision obtained by broaching that one machine is ample for most metal working plants. Few have as many as 10 or 15.

Consider, therefore, the importance of this particular aircraft engine plant in the broaching picture, with 91 American machines!

Their personnel *knows* broaching. They know the value of dealing with an old-line company whose principals have been identified with broaching since the turn of the century. They know, too, the importance of a *complete* broaching service—machines, tools, and engineering — for winning war production, profitable post-war production.

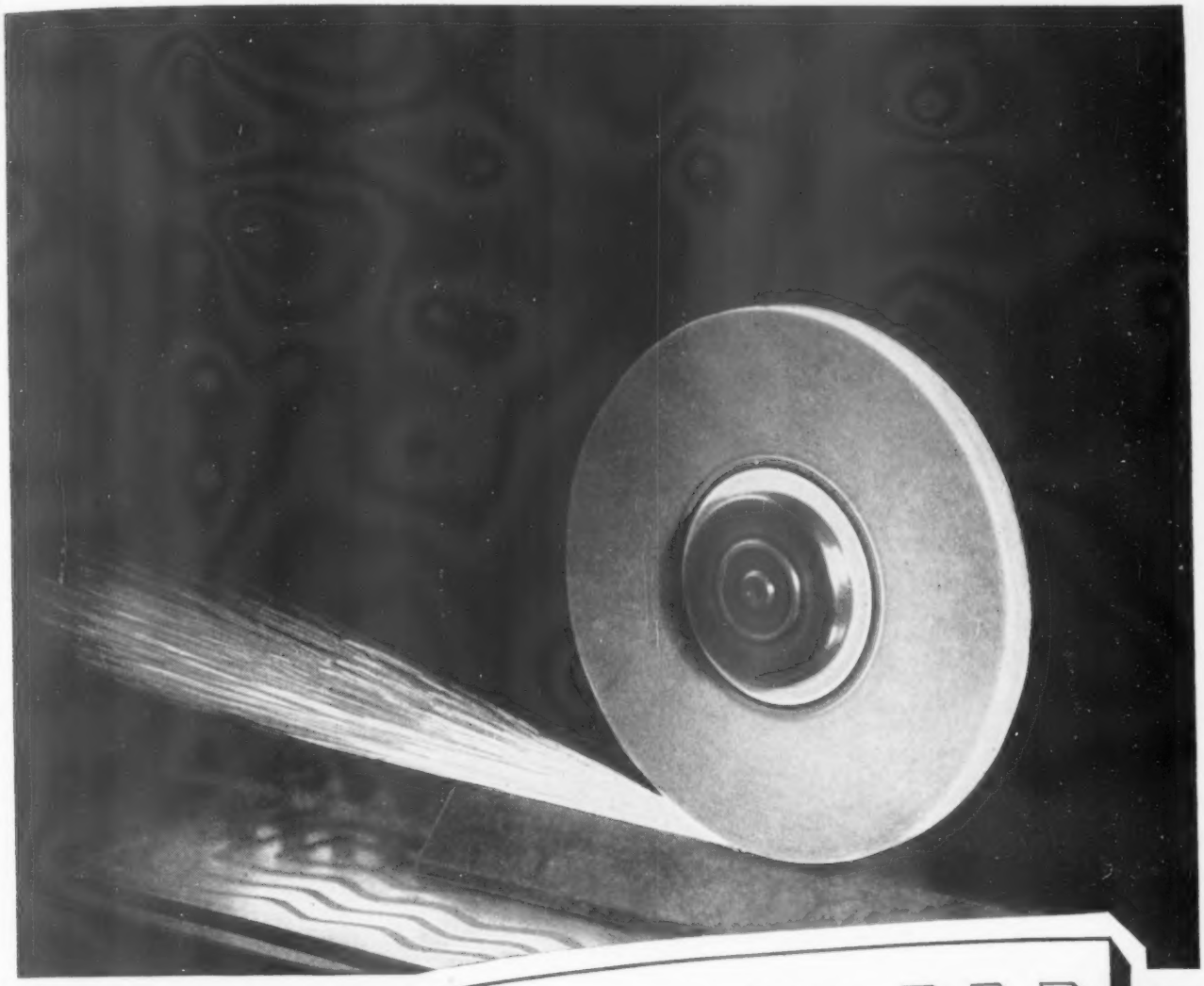
Significant is this overwhelming vote of confidence in American Broach equipment.

BROACHING IS BETTER
THE *American* WAY

American
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN
•
BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.



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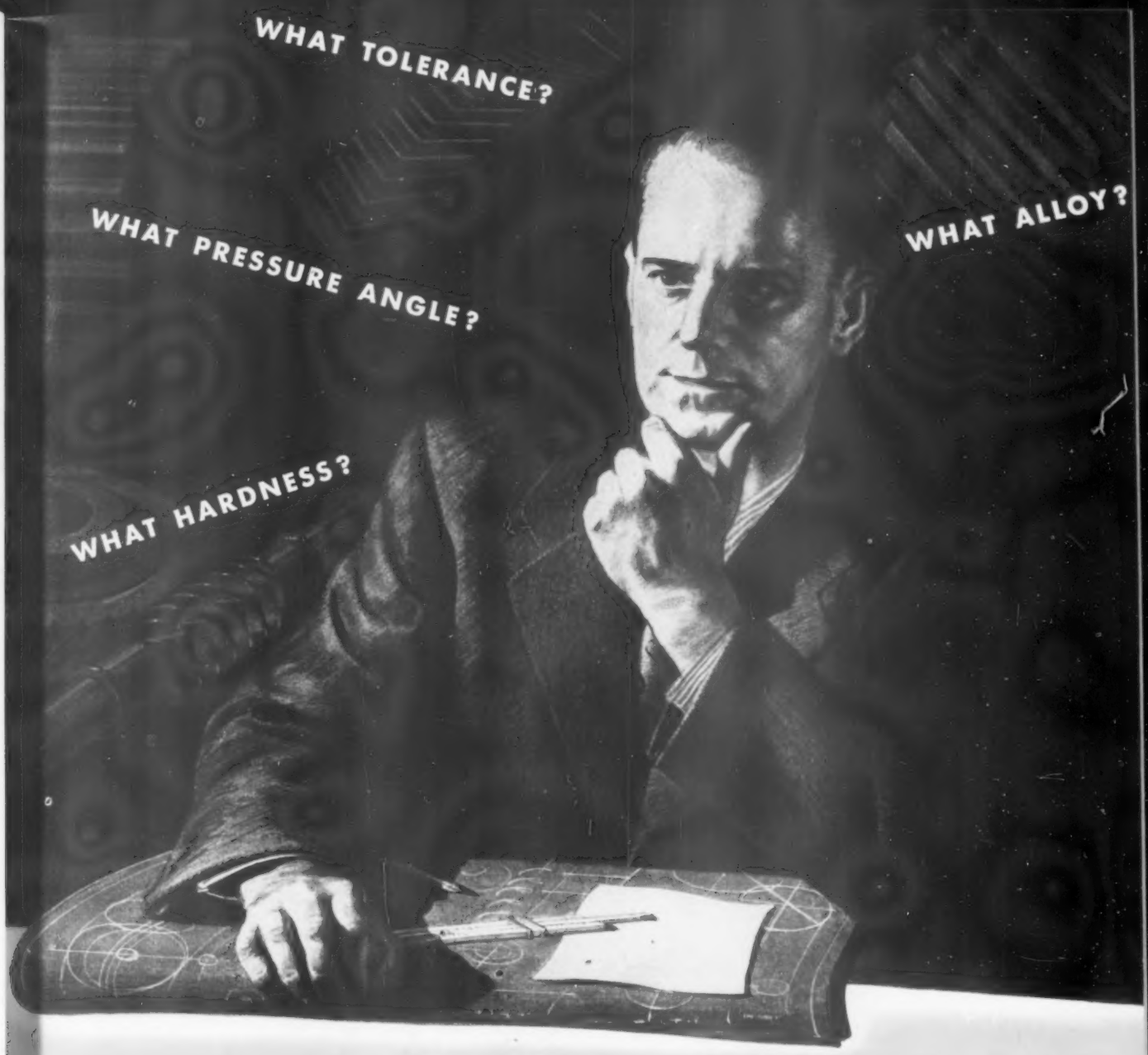

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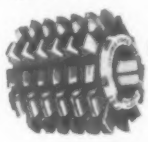
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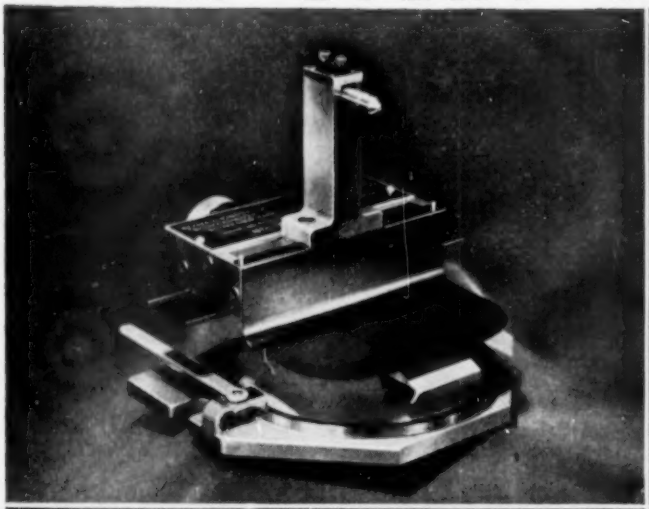
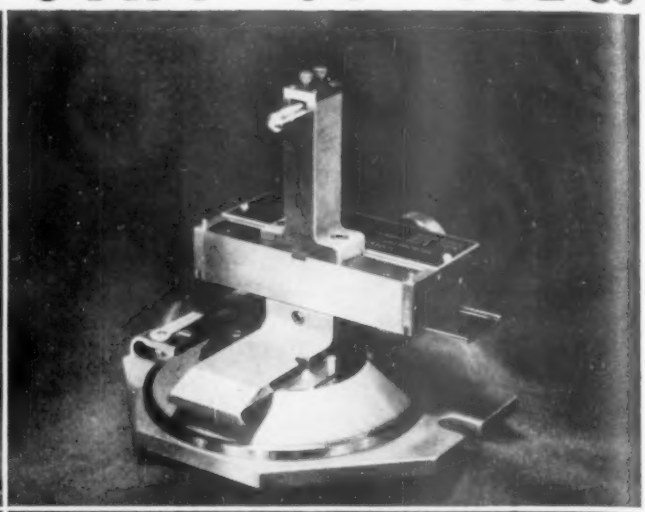
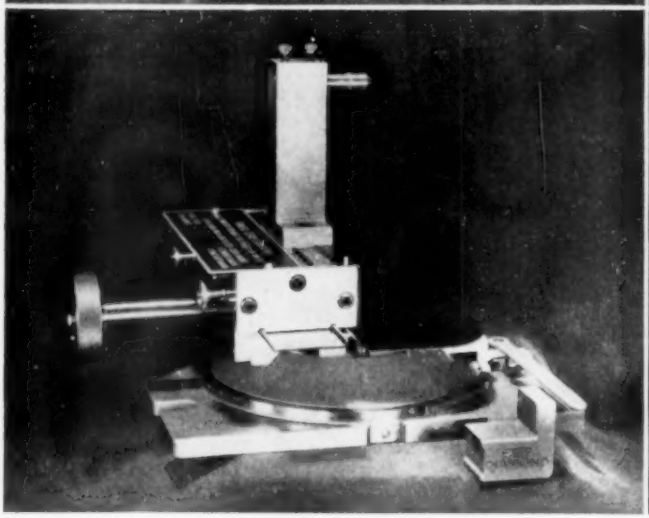
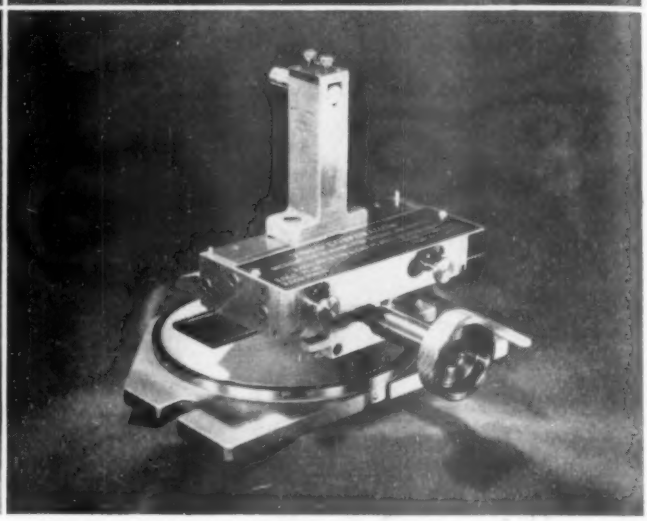
FROM EVERY POINT OF VIEW









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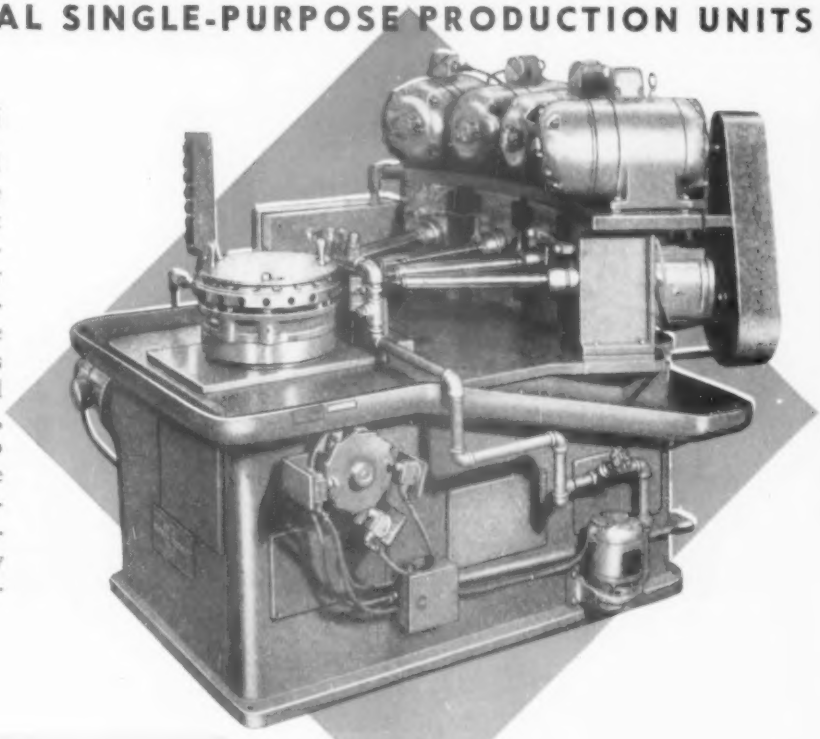
Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Ring Gages and Masters • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

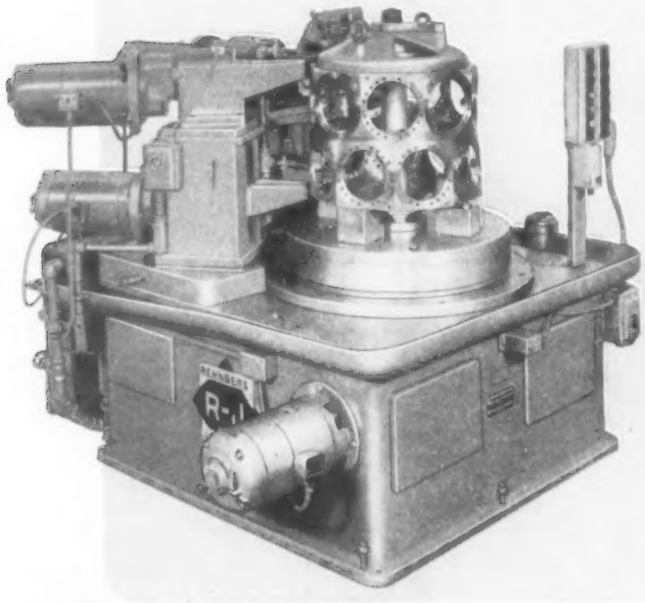
Production Machines by
REHNBERG-JACOBSON

STANDARD DRILL, TAP, AND INDEX UNITS COMBINED TO MAKE EFFICIENT, ECONOMICAL SINGLE-PURPOSE PRODUCTION UNITS

20 HOLES IN A RING

The purpose of this machine is to drill (.921″) and ream (.940″) 20 holes in the reduction gear pinion carrier for an aircraft engine. The piece is held in a fixture mounted on a *standard Rehnberg 20″ Automatic Index Unit* which is controlled by an 11-step program wheel (on the first step, the reamers rest; on the last step, the drills rest). There are four horizontally-mounted heads, two for drills and two for reamers, paired alike to drill two holes and ream two holes simultaneously. These heads are *standard Rehnberg No. 3 Belt Drive Drilling Units* mounted on suitable simple fixtures. This is an excellent example of how our standard units can be effectively combined for a production job.





18 TAPPED HOLES IN AN AIRCRAFT CRANKCASE

The requirement here is to finish one hole in the corner of each face on the forged steel crankcase of an 18-cylinder aircraft engine, for the attachment of auxiliary equipment. The piece is clamped on a *standard Rehnberg 30″ Automatic Index Unit* controlled by an 11-step program wheel (selected heads resting on the first two and last two steps). Drilling 13/16″ deep, and combination reaming (to .3178/.3176″) and chamfering (1/16″ x 45°) are done on both banks simultaneously by *standard Rehnberg No. 2 Self-Contained Direct Drive Drilling Units.* Holes are bottom-tapped 3/8″-16 by two *standard Rehnberg No. 2 Self-Contained, Interchangeable Lead Screw, Direct Drive Tapping Units.* This is another fine example of how our standard units can be used to provide a modern production machine.

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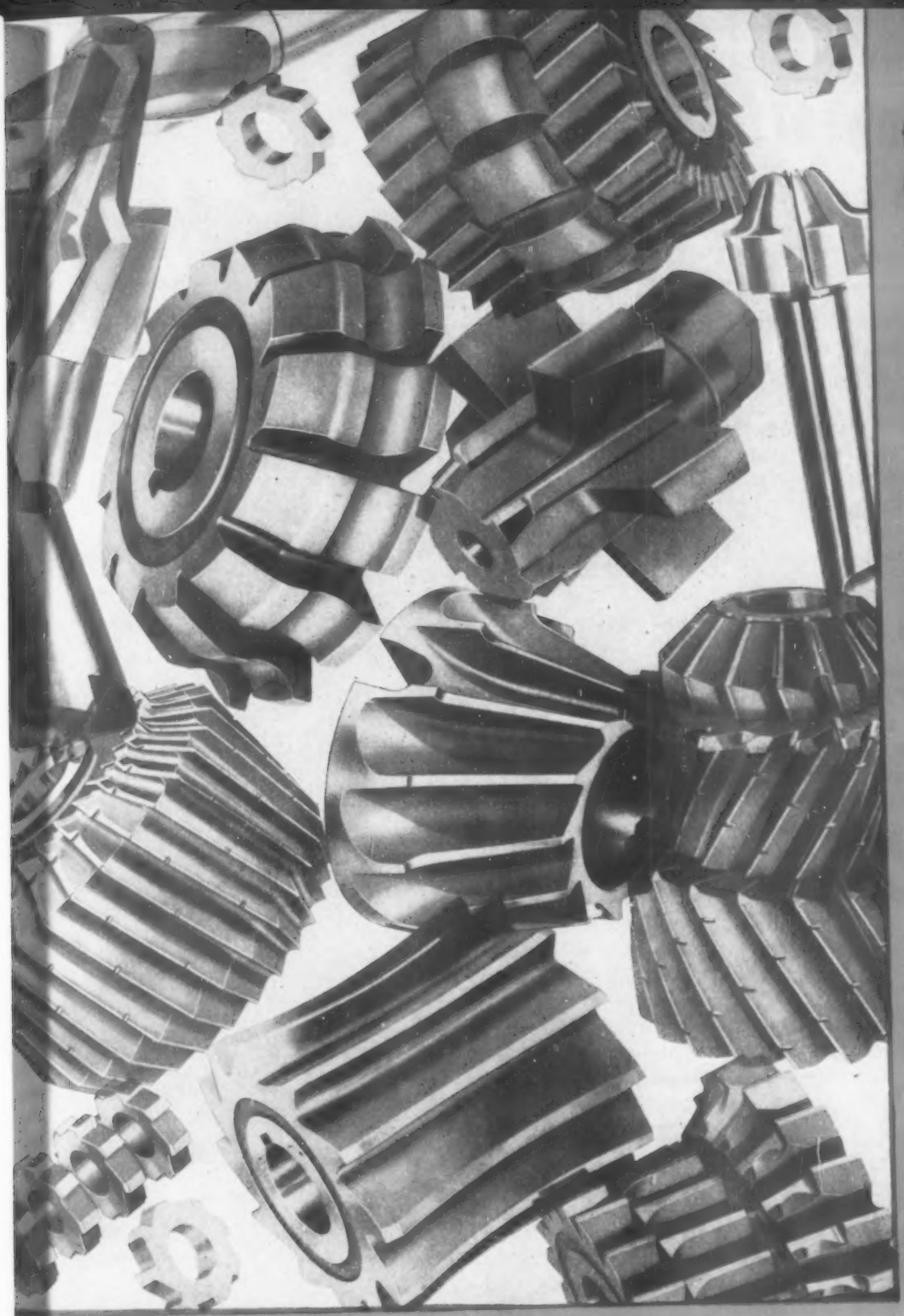

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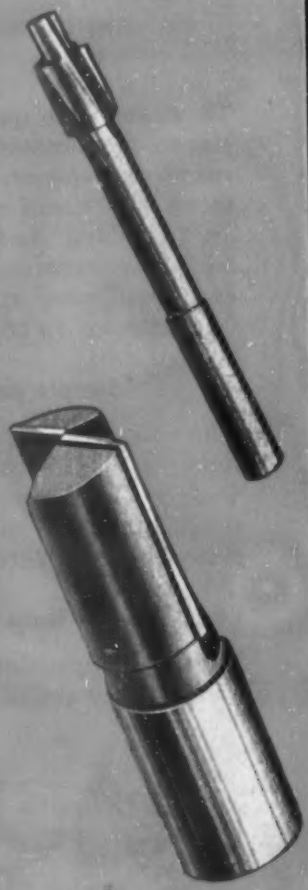

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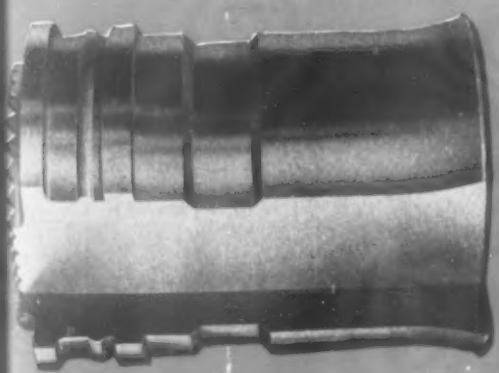

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How MIDWEST EXPANSION REAMERS make fewer reamers last longer, help conserve *High Speed Steel*

ONE MIDWEST REAMER EQUALS THE LIFE OF 6-18 SOLID TYPE, HIGH SPEED REAMERS OF THE SAME SIZE.

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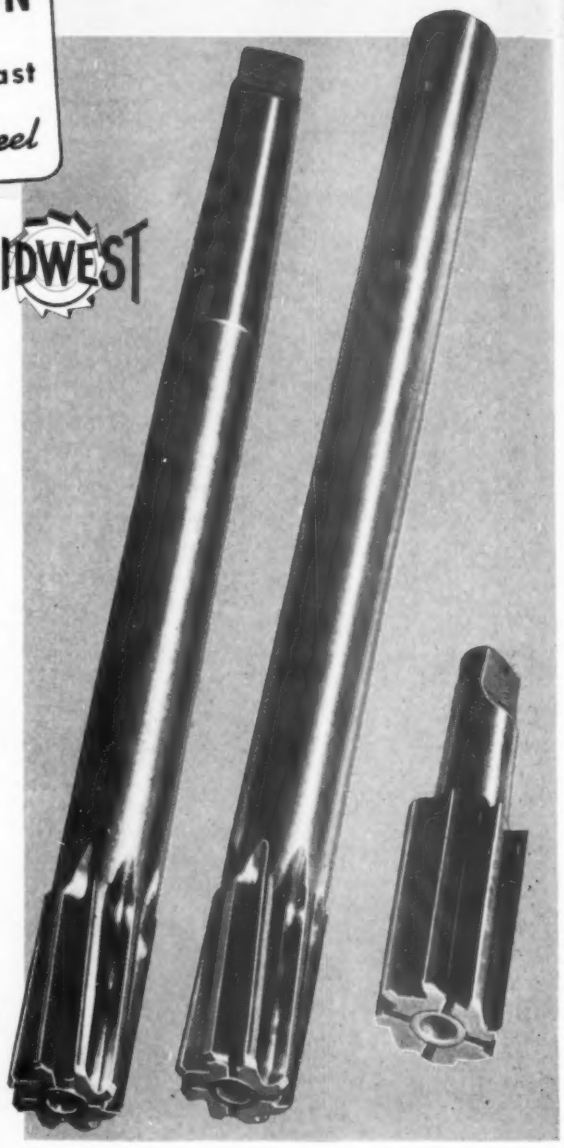

These reamers, quickly and easily expanded oversize to compensate for wear or to slightly increase reaming diameter, represent the equivalent of one more high speed solid type reamer each time they are expanded. And the delay and cost in securing additional reamers are avoided. The smaller sizes can be adjusted approximately 1/64″; the larger ones, almost 1/16″.

Simple and Accurate Adjusting

The end of the expanding plug is provided with a hexagonal hole and is adjusted with a small hex wrench. Expanding the reamer is thus a simple, quick operation of a few seconds, and the screw action permits very accurate adjustments.

They Help Save High Speed Steel

Midwest expansion reamers are made with a tough, alloy shank giving strength and elasticity back where strain occurs, and with a welded high speed steel cutting end; thus combining adequate strength and wearing qualities with conservation of high speed steel.

Save and Conserve

We can't all fight with weapons but there are ways in which each of us can help win the fight; we can save, conserve and use with utmost care every tool, every piece of equipment, every bit of material which can in any way contribute to our winning the war . . . and to help equip our fighting men, we can buy defense bonds and stamps.

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Cleereman

Jig Borers and Drilling Machine

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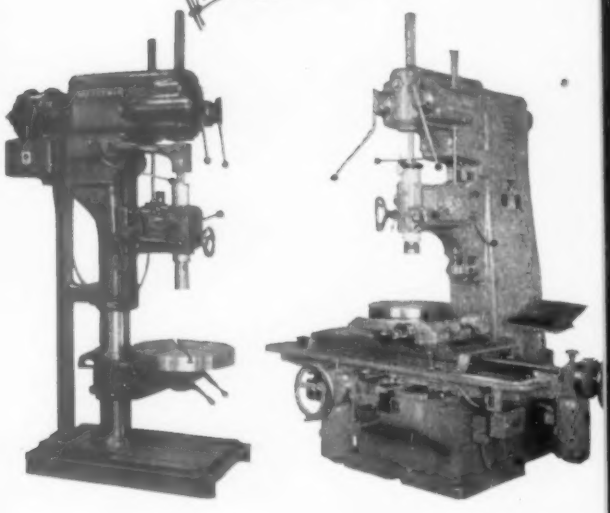
All control movements on Cleereman machines are made from the operator's position.



The Cleereman Jig Borer spindle control is conveniently mounted on the front of the base.

"Cleereman Controls Increase Output"

Correct speeds, increased output, and minimum operator effort are the results of convenient grouping and ease of operation of controls on *Cleereman* machines. Single lever selectors for speeds and feeds, binder levers, hand wheels, clutch levers, and the start-stop-reverse lever—are all easily reached from the operator's normal working position.

Added to this control feature, Cleereman machines also offer extreme range of adaptability, unexcelled accuracy, high speed production, and long working life.

Write for the new Cleereman Jig Borer and Drilling Machine catalogs!

BRYANT MACHINERY & ENGINEERING COMPANY

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Hannifin 25-ton hydraulic forcing press used on assembly operations at a plant of the Stewart-Warner Corporation.

FAST ACTION

ON PRESS ASSEMBLY OPERATIONS

WITH HANNIFIN

SENSITIVE PRESSURE CONTROL

Accurate press-assembly work goes easier and faster on this Hannifin 25-ton forcing press because of the simplicity of control. Operators can devote their skill and attention to the work, for the proportional control of ram pressures is so simple and natural, so easy to handle precisely that the effect is that of having 25 tons capacity at the finger tips.

Hannifin sensitive pressure control gives the operator any ram pressure needed, from a few pounds to full capacity, infinitely variable, and proportional to control lever movement. An automatic inspection feature is available, since the gauge shows ram pressure required to complete the assembly. Too tight or too loose a fit is plainly indicated.

Hannifin hydraulic presses are compact, self-contained units, with built-in motor driven hydraulic power. Many standard types are available, in capacities from 5 tons to 200 tons. Modifications in dimensions, speeds, and ram stroke are readily made to meet individual needs. Consult Hannifin engineers, or write for press bulletins.

Write for bulletins giving complete specifications of Hannifin products: Hydraulic Presses, Bulletin 60; Pneumatic Cylinders and Air Control Valves, Bulletin 57; Hydraulic Cylinders, Bulletin 35; Pneumatic Arbor Presses, Bulletin 46; Quenching Press, Bulletin 55; "Allen" Pneumatic Riveters, Bulletin 43; "Hy-Power" Hydraulic Riveters, Bulletin 53; Air Pressure Regulating Valves, Bulletin 56; Pneumatic Vises, Bulletin 59.

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HANNIFIN *Hydraulic Presses*

PRODUCTION PERSPECTIVES

T.M. REG. U.S. PAT. OFF.

WAR PRODUCTION: Arms output scored moderate gains in November, jumping 3 per cent over October. Increase, half that made in previous month, reflects growing difficulty in boosting production....Biggest gains were recorded in critical categories: Aircraft, Ships and Communications.

DETAILS: Easing manpower, materials and production problems permitted aircraft builders to hang up another record, turn out 8,789 units - a 5 per cent increase in numbers, a 7 per cent increase in airframe weight. December output topped 9,000 planes!....Donald Nelson, slated to head postwar industrial conversion job, says facilities construction is completed, that fuller utilization of existing plants must be achieved.

1944 GOALS: Talk of drastic cuts all around in war production has been dispelled by news of this year's WPB program (see page 118) for overall boost of 30 per cent in output....Aircraft is expected to score greatest gain, with a whopping increase of 185 per cent in tonnage planned.

MATERIALS: Easing situation is reflected in many places - excess production of aluminum, bigger steel allocations for civilian requirements, use of brass again in cartridge cases, elimination of 150 special WPB certification forms formerly required for tools and materials.

MANPOWER: Overall situation is improving, with slight drop in turnover reported....Net gain of 1,500,000 workers still is believed necessary in year ending in July....WMC says Detroit is a critical labor area. Motor makers say there is no manpower shortage because of improved production methods!....A WPB survey shows 234 recently installed wage incentive plans resulted in average increases over past output of 41.5 per cent.

GEAR SHAVING: Studebaker is saving 40,000 man-hours annually on aircraft engine gear production by use of shaving instead of grinding. One worker on gear shaver is said to produce as many units as five on grinders.... Gear shaving technique includes compensation for eventual heat treat distortion (see page 91 for methods set up by GM's Allison Division).

MACHINE TOOLS: Early reports indicate a sharp decline in November shipments, a reduction of backlog in December to about 3 months' work....Big industries are seeking Washington OK on plans to purchase DPC tools. Automen's theme to solons is "why spend $300 to move each government-owned machine out of our plant when we can use 75 per cent of them?"

RECONVERSION SIGNS: Automobile builders are screaming loudest, pointing to certain unemployment crisis unless retooling is commenced soon....General Motors has a $400,000,000-plus reconversion plan on paper.

LAST-MINUTE NEWS REVIEW OF MASS MANUFACTURING

How Can He Know She Will?

A technical sergeant, with a damaged plane to repair . . . his workshop, a beach in the South Pacific. Yet he promises a completed job as casually as though he were repairing the doctor's flivver in a garage back on Main Street.

What is the basis of his confidence?

At bottom, it rests on the standardization now practiced in all American precision manufacture. When every part of a complex mechanism is made to standard sizes, interchangeability is complete. Production is speeded. You have a reserve of replacement parts wherever you need them, when you need them. And you don't wonder whether they will fit . . . they're made to fit.

* * *

There are many fields in which still further standardization of threads is possible. After the sergeant and his mates have won the war we're in now . . . a fuller utilization of the existing accepted standards will help to win the even bigger battle we shall then face — to build a peace-time economy that will provide jobs for all who want to work.

Standard Threads - SAVE TIME - SAVE MONEY!

Full utilization of existing accepted sizes, pitches and forms can bring lowered costs to all manufactured products because: (1) it speeds production; (2) it reduces inventory. NOW, when plans for new and better products are taking shape —now is the time for a united effort to bring about greater standardization of threaded parts

Send for booklet "Selecting the Right Tap for the Job" — 18 pages of Facts, Tables, Suggestions

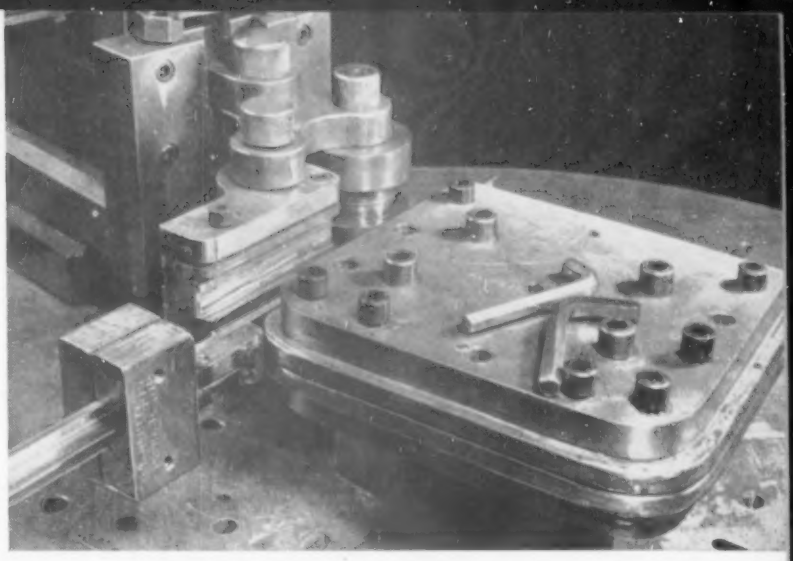
GREENFIELD TAP AND DIE CORPORATION

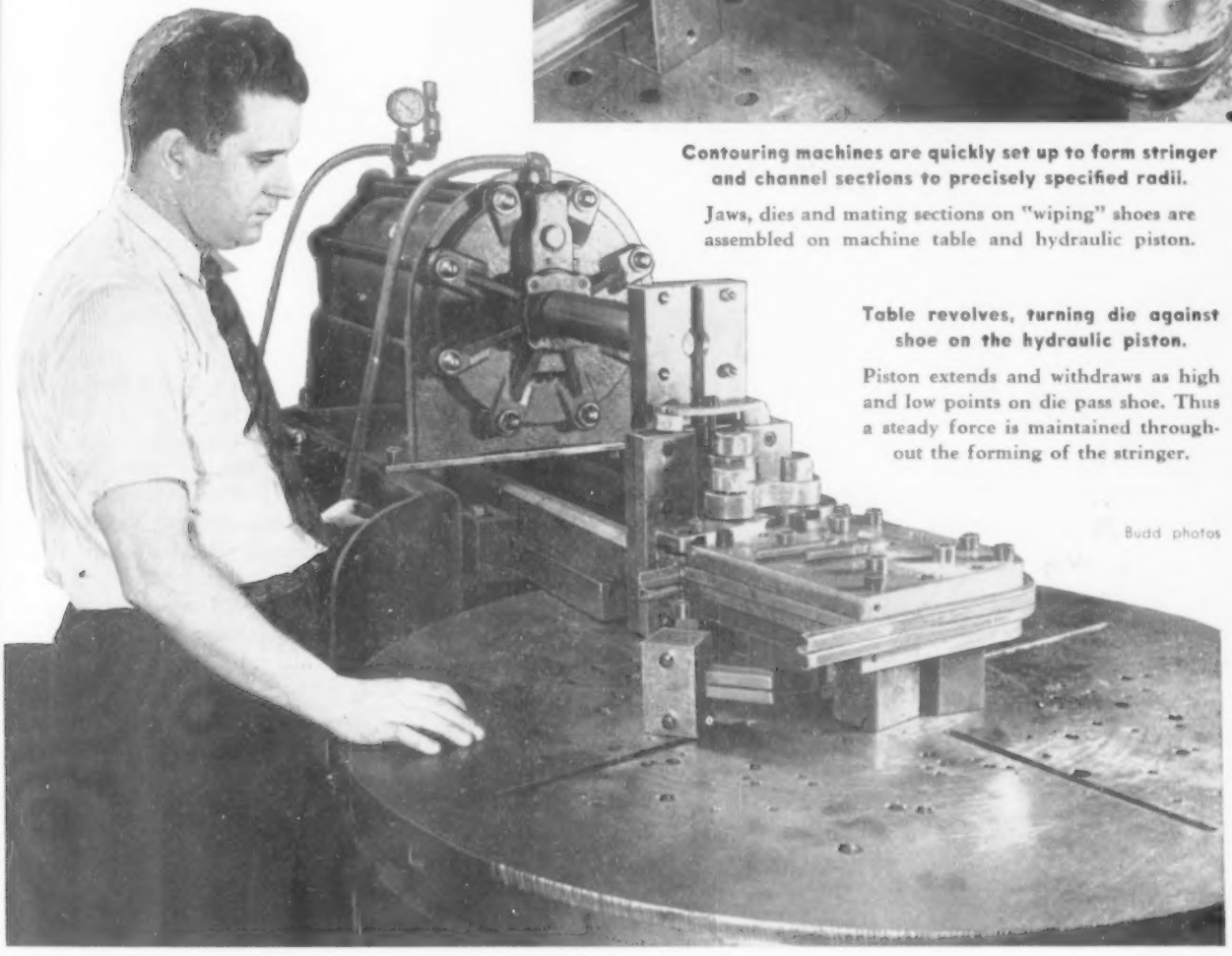
GREENFIELD
MASSACHUSETTS

Numerous unconventional methods are used in fabricating with stainless steels.

•

Here are techniques used on 18-8 in the shops of Edward G. Budd, largest producer of stainless steel parts





Contouring machines are quickly set up to form stringer and channel sections to precisely specified radii.

Jaws, dies and mating sections on "wiping" shoes are assembled on machine table and hydraulic piston.

Table revolves, turning die against shoe on the hydraulic piston.

Piston extends and withdraws as high and low points on die pass shoe. Thus a steady force is maintained throughout the forming of the stringer.

Budd photos

METHODS AND TOOLS FOR

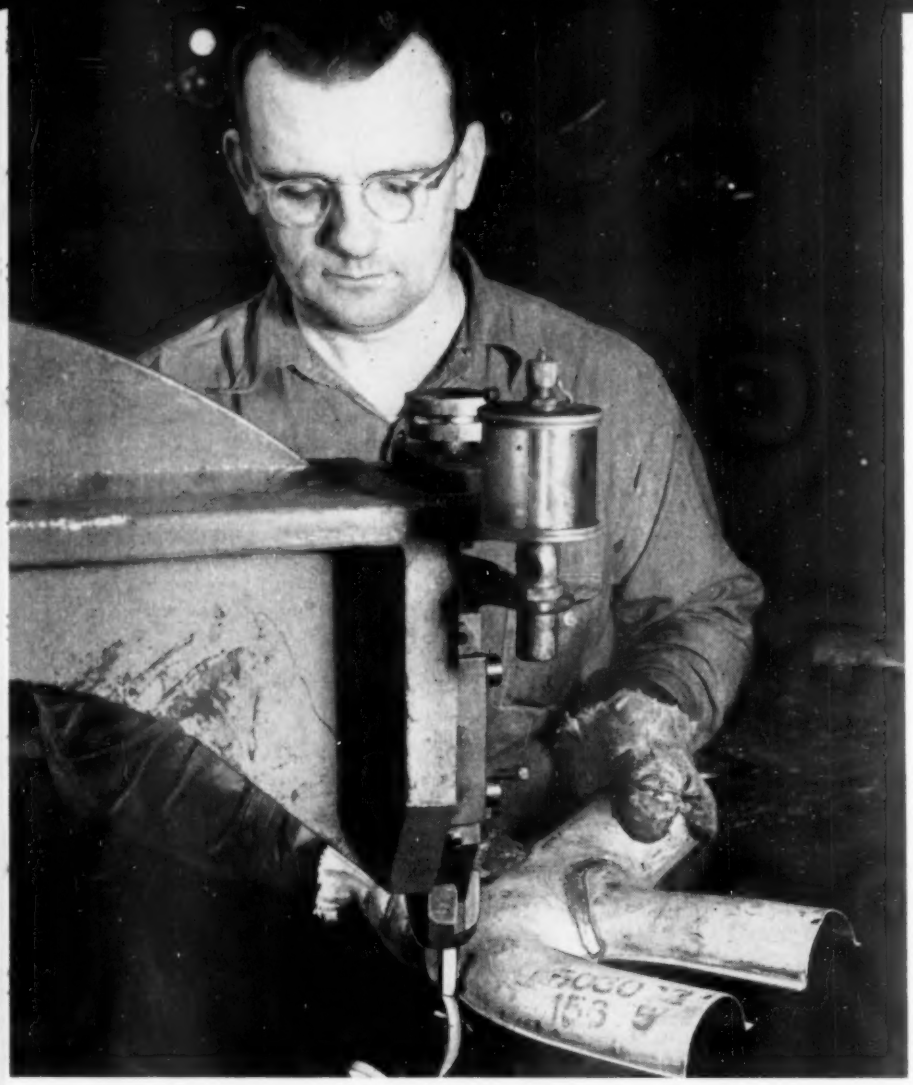
FABRICATING 18-8 STAINLESS

JEROME WILFORD
ASSOCIATE EDITOR

NEED of the Army and Navy for parts constructed from stainless steel has enlarged tremendously American manufacturing experience with the many varieties of non-corrosive alloys.

Probably no company has had a broader experience in stainless steel fabrication than the Edward G. Budd Manufacturing Company. During the ten years preceding war production, Budd produced more than 50,000,000 pounds of stainless steel parts. Production for that period required about 20 per cent of the company's manufacturing facilities. Now, fabrication from stainless steel utilizes approximately 80 per cent of the expanded facilities. All in all, this manufacturer has probably produced more parts from stainless than all other fabricators put together.

The major share of Budd work is with the 18-8 austenitic variety. Though dead soft grades are considered workable, they offer more problems, for example, than SAE hot-rolled 1010. Where the "1010" has a tensile strength of 45-50,000 pounds psi., 32-38 per cent elongation in 2"



Nibbler is used to trim metal and prepare edge of manifold section for welding. This is one more improvement on previous fabricating methods. Other advances are production of stamping 100 per cent complete, replacing extensive hand operations.

and a Rockwell "B" of 45-55, dead soft 18-8 austenitic has a tensile strength of 90,000 pounds psi., and elongation of 60 per cent in 2", but a yield point of 33,000 pounds psi.

Relatively, dead soft grades offer little trouble. Quarter and half-hard grades are generally tough to form, tougher to hold once they are formed. More important than these generalities, however, are the problems which are related directly to specific requirements. Slight variations in specifications of two shapes to be drawn may be magnified greatly in the difference of actually forming the shapes.

Die engineers, working with quarter or half-hard grades frequently ask for excess metal in the blank because they have provided a blank holder on the die. Though this metal must be sheared into scrap, sometimes amounting to considerably more than the finished part, blank holders take advantage of the elongating properties of 18-8 austenitic, permitting the metal to stretch and flow to desired shape. An example of the use of blank holders is furnished in the details of production engineering on a manifold.

Most manifolds have been made on a drop hammer, resulting in a stamping approximately 60 per cent complete. The remaining 40 per cent of the work was generally peened to shape by a skilled mechanic. Hammering and peening did not improve the material, instead it set up excessive stresses and often thinned the material at vital places.

The Budd Company saw the advantages of making a stamping in a double-action die which would draw the part to the desired shape, while the blank was held at the edges. This results in a stamping 100 per cent complete, with a uniform shape and section throughout. Also, a skilled operator is not required to operate the press, whereas skill is required with the drop hammer method, and a skilled workman is needed to bring the stamping to completion.

Yet, blank holders may not be required on one of two similar shapes to be drawn. The point of difference is not always definable, except by noting that what may be needed in one case is not required in the other. Without formulas, die designers may be inclined to play safe.

When drawing shells of stainless steel, a conservative attitude is often taken in deciding upon the number of draws required. Design engineers believe they save time and re-design expense by providing a margin of safety in an "extra" operation. Actually, it is not always extra, as in cases where a seemingly workable sequence proves a failure for lack of what appeared to be an unnecessary step when working the problem out on the board.

PRACTICABLE SEQUENCE

Much depends upon a practicable sequence in that stainless steel shapes must be drawn to size, as is illustrated by the experience with peening the manifold. Little can be done after shapes are pressed. Hammering inevitably work-hardens the material or dangerously thins it. Few formulas have been devised for the shapes to be drawn, with relation to the reduction sequence.

Laboratory tests on drawing 18-8 stainless have indicated that the more drawn on the first reduction, the better. Die designers agree with this idea, making the reservation that one should draw as much as will not impose excessive wear on the die, or prevent smooth flow of the metal in a later reduction. Their reservation frequently results in reduction sequences which do not provide for drawing as nearly complete a shape as is actually possible in the first reduction.

In getting a rush job started and to keep it going with a minimum of trouble, they do not impose excessive strains on first draw dies. This factor alone may be responsible for the "extra" operation, or it may be a generally cautious attitude in insuring against a variety of troubles all through the sequence. An added die, for example, can be insurance against the unpredictability of metals which are being received from the mills today. Further, less reduction per draw causes fewer die lubrication troubles. It permits faster operation of individ-

ual presses in most instances.

After a sequence has been put in operation, and it is seen that one more operation is needed to insure steady runs, it is difficult to alleviate the trouble by slipping in an extra draw. Such a step would hardly relieve stresses which are probably occurring throughout the sequence, unless the entire set-up is altered to effect a new balance of operations.

By first considering the ideal set-up, and then re-shifting the whole balance to permit the extra operation to be of value by equalizing its benefits throughout, probabilities are generally cared for. As pointed out, this common sense approach does not actually run counter to laboratory indications. Practical designers still consider it wise to draw as much of the form as possible at first, but they may feel that the possibility should take into account such factors as wear on the die, and the distribution of stress on the part itself, the reduction in wall thickness of the shell, and work hardening of the metal.

Harmful stress on the part may be the result of an excessive squeeze which does not allow sufficient clearance for stretch around the form of the punch. An indication of this is where metal is picked up on the dies, or where it sticks to the draw ring. Clearance is needed for lubricant also, though polished dies are one means of improving the spread of lubricant.

PRESS SPEED IMPORTANT

Another factor bearing on the stresses which may be set up in stamping 18-8 stainless is press speed. In experimental work on the manifold mentioned above, considerable scrap resulted from running the presses at conventional drawing speeds. By slowing the presses, the metal was given time to work into the proper shape, providing a more uniform wall thickness and distributing stresses over a wider area. Budd has long recognized that any steel which gets its high physical properties by cold work instead of heat treatment will stretch farther without cracking or without breaking if the stretch is made at a slow speed.

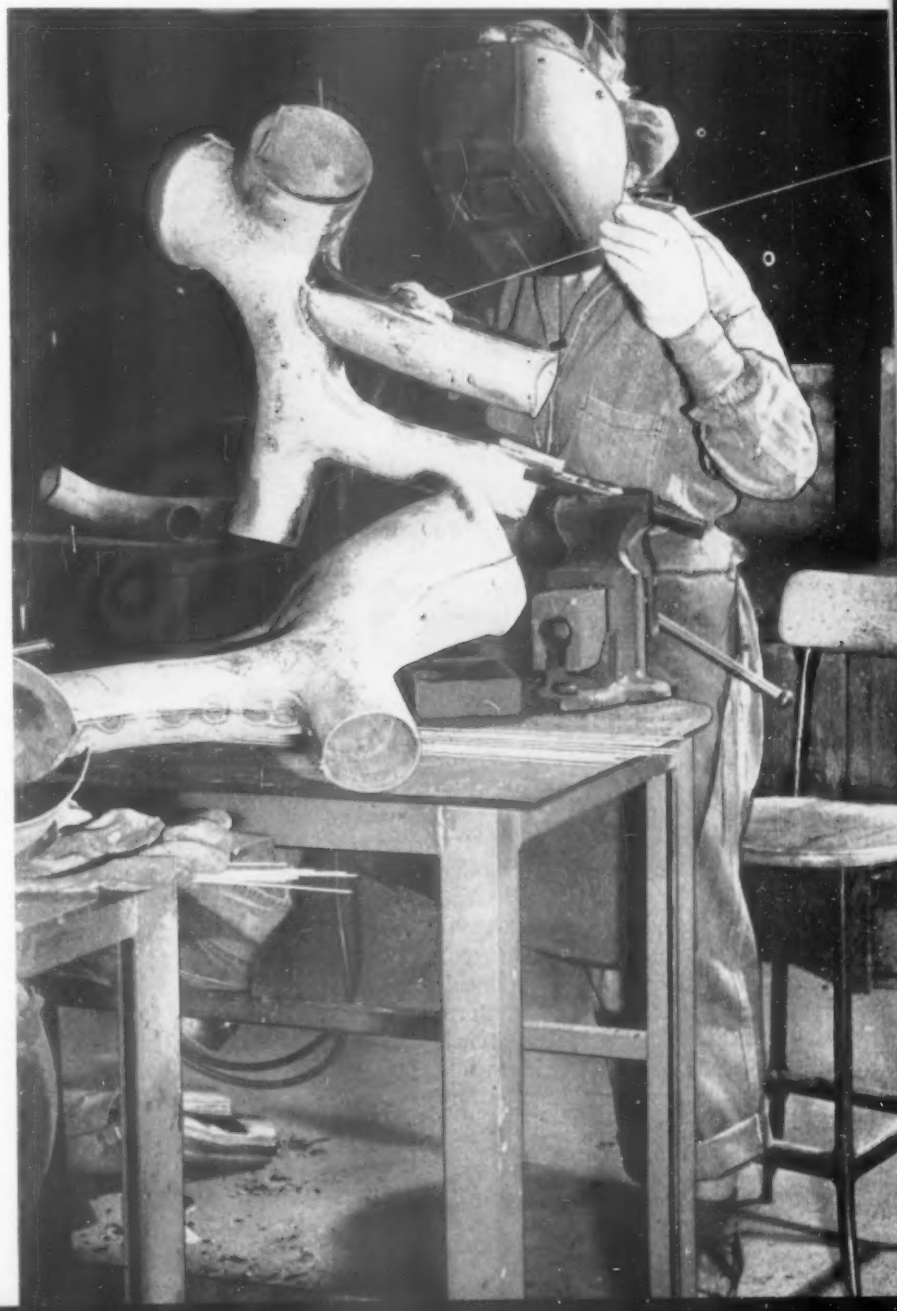
The following procedure is used in building the average manifold where the body of the part is made in halves in a punch press.

When the parts leave the press, they have two outer flanges which are located at 180° on a radial line with the center. These flanges are trimmed so that when the halves are together, a pair of flanges extends approximately 1/16″ above the outside diameter. The halves are then placed in a tacking fixture and an operator tack-welds the flanges together with an acetylene torch at approximately 2″ intervals. The manifold is then removed from the tacking fixture and the flanges are welded complete, out of the jig.

In this welding procedure, the burning down of the flanges themselves constitutes the weld and only a small amount of excess material is added where small holes appear. Conventional uncoated stainless steel welding rods are used wherever needed. Welding is performed at a speed of 2¼″ to 2½″ per minute on straight runs and from 1½″ to 1¾″ on curves.

After the manifolds are completely welded, they are annealed in a furnace at 1950° and cooled in air. This relieves all internal stresses. After the annealing, a pickling operation removes all scale around the welds. The manifolds are then washed to remove pickling acids. Sandblasting gives a uniform appearance. After sizing, the part is given a passivating treatment which removes all free iron that might be deposited on the stainless steel in

Women operators are trained to gas-weld the port on aircraft manifolds. Burning down the flanges left from the nibbling operation which followed stamping constitutes the weld, except for patching small holes. Stainless rod is used.



Overall view of the horizontal chain bender, another machine for contouring stainless steel.

Drive sprocket engages roller type chain on inner face of the mandrel, causing the mandrel to revolve, or move, against pressure of shoe. Collar on top of sprocket holds mandrel in place, preventing it from climbing.

the stamping operations.

The ends of the manifolds are placed over an expanding mandrel with a heavy ring over the outside of the part. While in this position, the manifold is stretched to a specified diameter and flanges are welded to tubes protruding from the main body of the manifold.

These flanges are ground perfectly flat. After the manifold is completed, it is placed on a float table and, while in this position, floating plugs, accurately located, are inserted in all openings to assure uniform shape and size. This results in a part of uniform section, interchangeable with all other parts which satisfactorily pass this inspection test. Clamping brackets are generally made of stainless steel, stamped and Shotwelded to the manifold. This welding is of uniform character and the welds are scientifically made and spaced in such a way so that fatigue does not in any way affect or weaken the manifold where the welding occurs.

Rubber dies are not used in the plant, but experiments have indicated that where the sheet is thin, and precision fits are not required of the finished parts, rubber dies can be used if the formation is generally straight or no crowding of the metal occurs during the formation operation. Present indications are that "soft" dies are war-time provisions, however.

CONTOUR MACHINES

Contouring stringer or channel sections from 18-8 stainless steel strip, compared to similar forming methods used on automobile steels, poses problems of dealing with high tensile strength. Advantages are in working with a high yield point and relatively good elongation. Hat sections, Z-shapes and irregularly angled forms are drawn into a compound radii on contouring machines, frequently with the help of Masonite dies.

Contour machines stretch or "wipe" the strip around a form conforming to the desired bend. Shoes with rollers, in which the strip section fits, hold the channeled strip against the mating edge of a turning die or mandrel. The shoes are held against the turning mandrel by the constant pressure of a hydraulically actuated piston. Piston and shoe recede at contact with the high point of the mandrel's curve, and advance at low points. Pressure of the shoe against the mandrel is approximately 400 to 450 pounds per square inch.

An efficient mandrel drive is obtained through a chain and sprocket set-up, in that a steady tension is provided. However, this type drive is neither practical nor economical for forming small radii or small parts.

In contouring, the leading end of the strip is locked to the mandrel. Usually, two shoes are employed, the first guiding and holding the strip against the mandrel so that the full force of the second shoe is utilized to form the radius.

Where a mandrel or turning die is too large to fit over the machine table, or to clear between the spindle and the hydraulic piston, dies are used

which conform to half the desired contour. One half the strip is then formed in short run production, the mandrel is reversed and the other half is produced.

Depending upon the stretch factor and the relation of the radius to the length of the strip, the shoe and piston set-up may or may not set the form permanently. In finishing most shapes, the contour is "set" on a special stretching machine which pulls the formed strip over a die.

STRETCHING FIXTURE

Pulling from the center of the arc, this operation stretches each side of the contoured form over a point on the tangent to the neutral radius. An elongation of approximately 1¼" in 40" is generally sufficient to set the form.

A stretching or setting machine consists of a hydraulically operated table equipped with hydraulically actuated vises or clamps. The jaws take chucks formed to the size of the particular section being stretched. With relation to a stationary pin over which the die is placed, the hydraulic cylinders can be placed at any angle or distance required, and secured by clamping through slots in the table.

Masonite dies have worked well on all but small radii, which impose stresses that tend to break down the corners.

On some compound radii, it is necessary to perform two stretching operations from different positions with relation to the die. In such cases, the strips are first stretched from a point on a tangent to the radius near the crown of the contour, and second from a point near the ends of the curved form.

In manufacturing stringer sections for a tapering fuel tank for plane wings, all frame sections are produced to the same dimensions on the regular contouring machines. They are then stretched on special equipment. Using the identically formed shapes as stock for this machine, the stringers are drawn or stretched down from the largest contour required, to the smallest thus providing frame sections in all specified graduations which can be arranged to provide the taper.

REINFORCING THIN GAUGES

In furnishing the aircraft industry with stainless steel tanks for water, fuel and oil, the Budd Company solved another problem in fabrication which had never been met satisfactorily. Demand for a low weight item made the use of thin gauge stock necessary, and though tanks had been built which would stand static pressure tests, they generally did not pass fatigue tests. Budd engineers conceived the idea of reinforcing the seams with a strip of metal or plate on both sides of a built-up section which assumed the load and relieved the fatigue.

For example, where an outside skin of .010" thickness required an angle ½" by ½", .010" thick, welded to the inside, the outer skin tended to peel away from the angle. Reinforcement in this instance consists of a

Stretching press, showing hydraulic cylinders which apply pull to "set" stainless contoured forms.

Each cylinder can be separately set up on the table by means of "T" slots. Because they can be placed in any position required, it is possible to apply stretch throughout the entire length of the workpiece.

.012" strip, approximately ½" wide, on the outside sheet, and a strip of the same dimensions inside the angle. The seam weld is made through the four thicknesses at one operation. The skin sheet then ceases to vibrate past the outside strip, and the weld is not stressed by the vibration.

Where thin gauge metal suffers from fatigue across its surface, stiffeners may be seam welded to the metal. In attaching fittings to tanks, the various items are first welded to a plate, and the plate is then seam welded to the thin gauge metal. Seam welders have been developed which can be operated with one handling for all the tanks which Budd builds. In all cases, jigs are available to hold all of the parts in proper position, to achieve complete interchangeability.

Handling "Lightweight" Stainless Steel

Budd production procedures and methods in fabricating ship parts from thin-gauge high-tensile metal

•

Welding stainless lightweight parts is made possible through Shotweld.

Use of unskilled labor, introduction of production methods, are war-time contributions to fabricating stainless.

PIONEERING stainless steel parts production for the Navy, the Edward G. Budd Manufacturing Company developed the Shotweld system of welding. A structure of very thin gauge high tensile stainless was made possible, bringing true an age-old dream of naval designers. "Lightweight" materialized for fabrication of stainless steel masts, doors, hatches, manholes and stacks.

Accurate jigs were developed and manufactured to permit construction of stacks and masts on a large scale. Some of the assemblies had to fit together perfectly at final assembly, despite the fact that they were built in different parts of a fast growing plant.

The stack was so designed that the outer shell of .020 high tensile steel reinforced with .016 high tensile corrugation may be easily removed for minor or major repairs. For the inner stack, .040 molybdenum bearing stainless steel, reinforced with vertical Zee-stiffeners, is used to prevent carbide precipitation and resulting corrosion. Special joints are built at given intervals to offset expansion and contraction of steel under all conditions of heat or cold.

All assemblies are completely jigged to insure perfect alignment. Since the inner stack is the structural member, and the outer stack only a cover to prevent condensation on the inner stack, the space between is used in conjunction with the ventilating system to the boiler rooms. Inner and outer stacks weigh only 3700 pounds.

The stainless steel mast is a fabricated structure ranging from .078 to .125 thickness through its 68 foot height. It is reinforced at intervals by internal bulkheads. All types of fittings, such as platform, Jacob ladder brackets, ladder and light brackets are installed all the way up the mast. Absolute location of these fittings has been made possible by an intricate jig set on an angle to simulate the correct ship position. No rivets or bolts are used in conjunction with arc welding or the Shotweld process.

When beginning a job, it is a Budd custom to hold a round table conference between Engineering, Planning, Shop, Jig and Floor Layout Departments. Engineering designates important points that must be held to meet design requirements. At the same time, operation and assembly procedures are roughly mapped so that a production floor set-up can be made to satisfy production requirements per day, week or month.

In discussing jigs, consideration of possible changes in design or locating points may be left to the discretion of the engineering department.

Once materials are received, necessary orders are issued to the shop to make up parts for the assemblies. One of the first items usually is a drawbench job. Rolls are set up and tried out on the drawbench until the part can be manufactured to the satisfaction of the part—drawing and inspection departments. Occasionally, rolls must be re-worked because of some difficulty encountered in the tryout stage. Meanwhile necessary sub-assembly and assembly jigs are made and set up on the production floor according to the shop layout. As quickly as the pieces and sub-assemblies are manufactured they are then set up in the assembly jigs and tried out by running through the pilot set.

The tryout period, carried through all the assembly jigs, assures interchangeability.

During the tryout stage and the production runs, any suggestions submitted by shop workers or the rate department are thoroughly checked by the engineering department both from an efficiency standpoint and from the design angle. If they prove practical, engineering changes are issued and incorporated.

THE END

THREADING

A one-page primer to paste in your hat, reviews important factors on producing smooth, accurate threads. Design and care of tools, gaging, tool and machine attachments, and machine conditions are considered

R. R. WEDDELL
WEDDELL TOOLS, INCORPORATED

THREADING TOOLS are more than metal removing devices. They also guide and size. Therefore, a prime consideration in obtaining smooth, accurate threads is the start of the die or tap. If a positively accurate thread can be produced in the first turn or two, clean threads follow easily.

• **Chasers** should be furnished with throats two or three threads long. Threading close to shoulder requires chasers with a short throat or 45° chamfer. In threading close to shoulder, chasers may strike the shoulder, and short chamfer chasers are subject to more wear, are apt to chip or break because of the greater load imposed on them. Long chamfers insure better finish, efficient cutting, longer tool life.

• **Correct lead** depends on several factors. Clearance on the chamfer determines whether chasers cut easily or hard, producing a fast or slow lead. Correct rake or hook, as well as the shear angle on a chaser, affect the lead. Lead can be made fast or slow by an operator pushing or dragging the turret. A "sticky" machine produces inconsistent results. If the turret is particularly heavy, threading tool adapters should be used which hand feed the tool more sensitively. For high accuracy, particularly for fine pitch threads, lead screws should be used. This feature concentrates tool performance on accurate cutting.

• **Finish of threads** is first determined by the machinability of the material, which in turn determines cutting angles and cutting speeds. Rockwell "C" 35 hardness is about the limit for regular threading. Dull chasers prevent good finish. When chasers "pick up", try increasing the rake or hook. If they chatter, reduce the hook or clearance. When chips pile up in the tap or die, endeavor to permit the chip to get away by incorporating the gun tap grind on the nose of the tool.

Threading tools or chasers should not be hand ground. Tap grinders and chaser fixtures are available.

• **Tapered threads** can be caused by misalignment or machine drag. Taper at the start of threads produced by self-opening die heads or collapsible taps, may be caused by loose chasers, or chaser holders that cock up at the start of the cut. Taper at the end of threads made by these tools is caused by worn trips or cams that allow the chaser mechanism to open slightly before the head or tap releases fully. What seems to be a tapered thread may be caused by an off lead condition.

• **Gaging methods** are an essential consideration. Three variables—pitch diameter, lead, and form—soon consume tolerances. Lead errors quickly reflect errors in pitch diameter and form. Lead tolerances should consider actual length of engagement.

Taper should be checked by comparing pitch diameters rather than major or minor diameter. Thread form in cut threads generally tolerates plus or minus allowances of about one-half to one degree. Thread form in "Go" gages should be relieved so that only the flanks of the threads bear. "No Go" gages should be further relieved so that the gage bears on one-half to two-thirds of the flank, checking particularly the pitch diameter. But, any broad tolerance in diameter or form considerably affects the lead of a thread, and if the thread has a long engagement, it should not be expected to pass close inspection.

• **Machine conditions** must be checked. Misalignment of spindles and turrets is too common. While floating tools alleviate this condition, the real remedy is correct alignment. Loose spindles affect finish and accuracy. Slides carrying threading tools must not bind or pinch, cramping feed. Camming should be such that the tool starts and leads correctly. While lead screws are recommended, wherever possible, watch tripping action which may permit die heads to pull ahead of the lead screw. Use external or internal trips. Proper speeds should be available so that no undue cutting speed is placed on the tool.

• **Tool breakage**, frequently too high, is often caused because chasers are allowed to wear unreasonably. Chamfer should be enough to prevent striking a shoulder on starting. Cutting edges of thread cutting tools should not be called upon to perform boring, facing, or hollow milling operations. Drag of the turret or carriage can place undue strain on the teeth of the tool. The die head or tap should be in good condition. Worn or loose parts will throw chasers out of line and cause them to break. Or, if the tools are not set to size properly, the thread cutting chasers may be overloaded. Similarly, the turned size of stock should be correct for the desired size of work.

• **Standard specifications** of threads should be adhered to. Special thread sizes mean extra delay and expense. Understanding the difference and use of the various class fits will assist in obtaining desirable threads. Not always are better class threads necessary or desirable. The specification and use of generous chamfers and recesses on the work is not generally appreciated. Such a procedure generally improves the mating of the parts. The use of 100 per cent threads is generally unnecessary. A 75 per cent thread is only five per cent less strong, and requires but one-third the power to tap.

• **Special modifications** of tools allow economical performance affecting accuracy and shape of the work. More sensitive stops or trips can be obtained with internal or external trips, particularly in cutting short, fine threads. Taper threads can best be cut by receding chaser or taper attachments. Ground or lapped chasers should be used for accurate, smooth cutting. Special shanks with buffers, aid in starting the thread, particularly on light, high speed automatic screw machines. THE END.

Screw Machine Progress

Attachments for burnishing, cross-drilling, and eccentric hole drilling are featured in this fourth in a series of articles on increasing the range and functions of automatic screw machines

JOHN E. HYLER

THE NUMEROUS design advantages of various makes of automatic screw machines are fairly well known. Not as familiar, but highly important to efficient operation are the attachments and auxiliary devices which have been developed to increase the range and functions of each line. A large share of screw machine progress is attributable to them.

This attitude is particularly applicable in considering the equipment manufactured by the Cone Automatic Machine Company. Because basic features of this line of four, six and eight spindle automatic screw machines are generally known, there is more pertinent value now in consideration of certain attachments. However, to make an exception, one exclusive design feature, the overhead camshaft, merits attention.

Housed in a top enclosure, the overhead camshaft carries the drums to which cams are attached for operating the cross-slides, stock feeding mechanism, main turret slide, collet-closing devices, and any auxiliary attachments required in a given set-up.

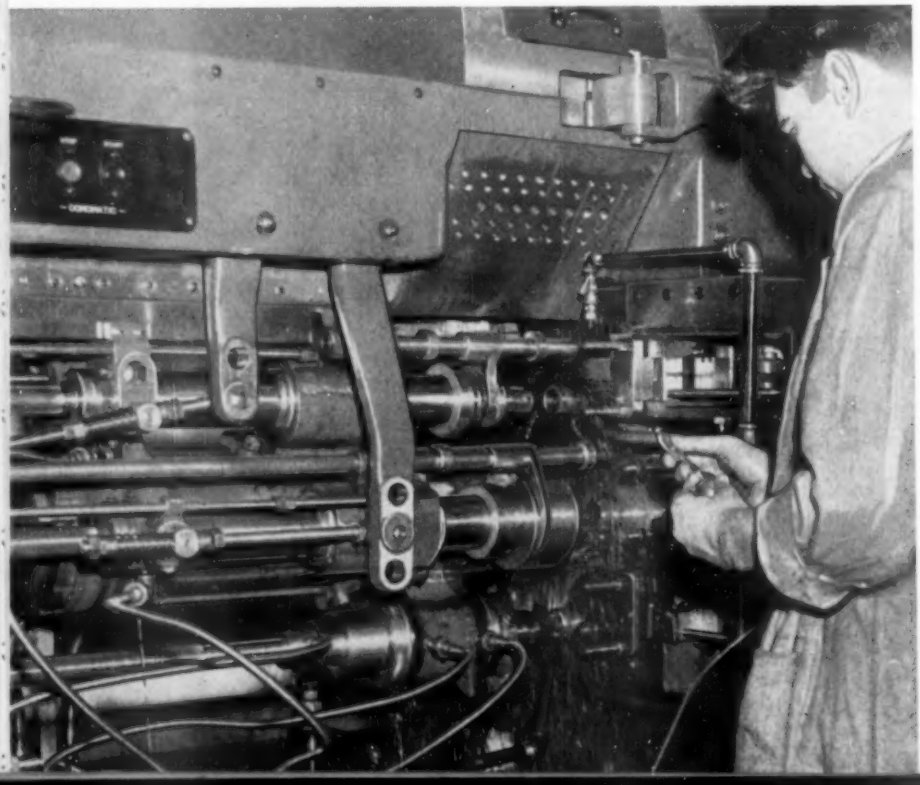
BURNISHING ATTACHMENTS

Several screw machine attachments for burnishing cylindrical exteriors have three radially-adjustable rollers, spaced at 120°, and set to burnish the work as they are passed over it. Radial adjustability of each roller permits "adjusting out" any misalignment. The three point contact, offering perfect support for the tool, helps maintain accuracy.

Specialized attachments are available to burnish beveled faces on gears and the holes in the gears. The latter receive both rough and finish operations, so that there are three separate burnishing operations in the machine cycle.

Eccentric hole is drilled in ordnance part without stopping spindle on this six-spindle Conomatic. Figures 6, 7, and 8 show details of this attachment.

Cone Automatic Machine photos and drawings



The general appearance of these gears, and the cycle of operations, are shown in Figure 1. In forming these gears, the stock is advanced to allow enough projection so that certain initial forming cuts can be made at the fifth and sixth positions. That is why the stock comes to the first position as shown, without any forming tool being in evidence.

A drilling operation is performed only in the first position, while in the second and third positions, combined drilling and forming operations are performed. In the fourth position, an internal necking operation takes place, in connection with further forming, but so far as the extreme forward face is concerned, this is the final forming.

In the fifth position, the face is burnished. The face burnishing attachment assembly roughly indicated in Figure 1, is shown in detail in Figure 2. This attachment is mounted in an auxiliary dead spindle, in a holder on the main toolslide.

The bevel-faced members bearing against the gear face rotate as they engage the gear on the forward movement of the toolslide. The head of the hardened shaft on which they turn is flatted on one side, and locked with a pin. End thrust of the bevel-faced members is taken by the thrust bearings shown. These can be shimmed if necessary to take up wear.

At the sixth position, the gear is reamed preparatory to burnishing the hole. In position seven, a final finish forming takes place on the peripheral surfaces of the work, and a rough burnishing operation takes place in the hole. In the eighth position, the finish burnishing operation is performed just before the gear is cut off. Figure 3 shows the means for mounting and advancing these two burnishing attachments.

The uppermost of the two (shown in the seventh position) does the rough burnishing. It is mounted rigidly in a holder on the main toolslide, and takes the travel of that slide di-

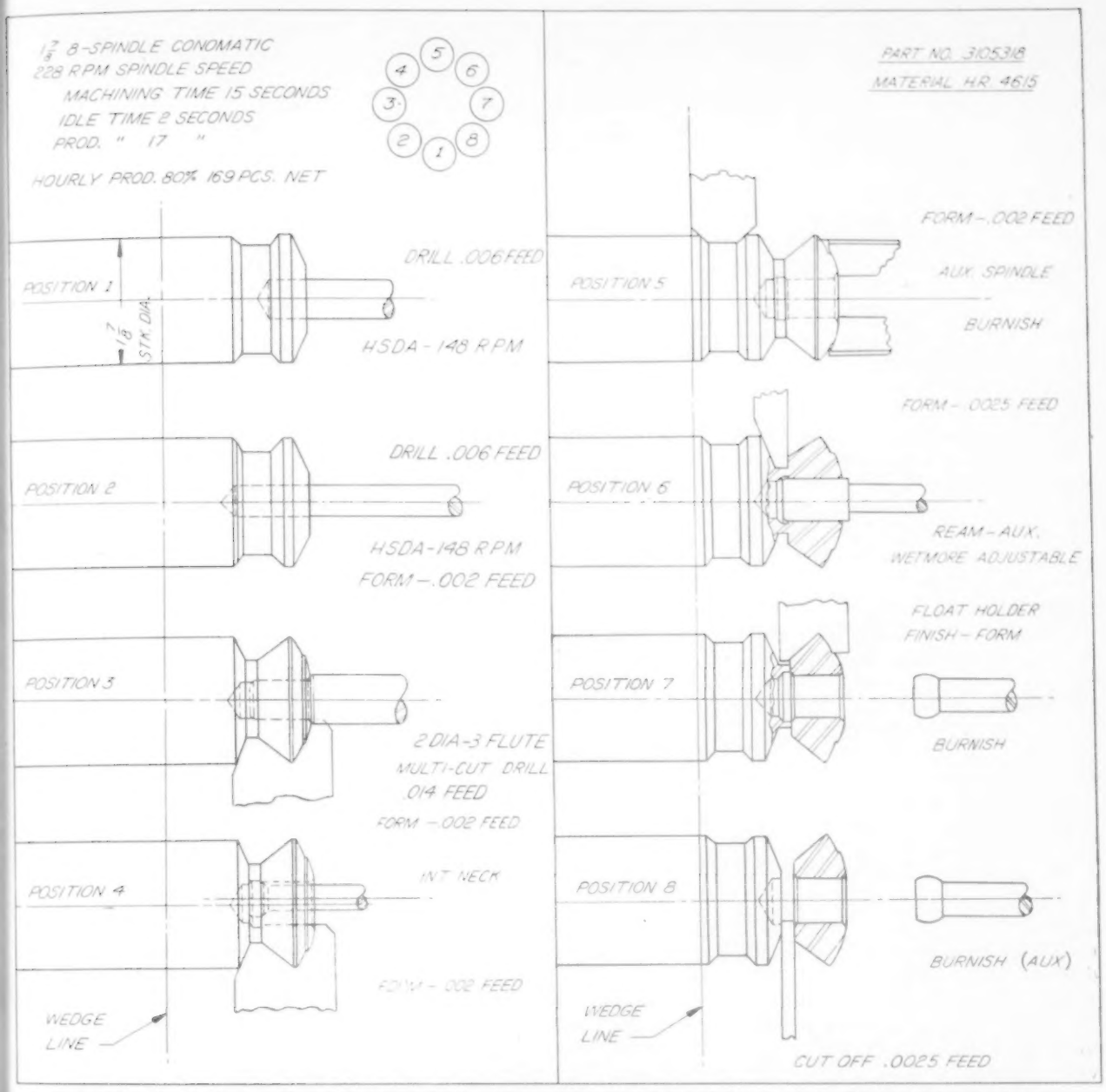


FIGURE 1. Cycle of operations which includes burnishing face and hole of bevel gear with special attachment.

rectly. A special arrangement is provided for the other attachment, in the eighth position. All that remains of the internal necking cut is a chamfer.

Figure 4 shows that hole burnishing attachments have been designed for self-centering. The shank F is supported in the throat of an auxiliary dead spindle. The burnishing spindle B is held by the set-screw C1 in the member C, which is free to rotate in the head D, though it is normally at rest. Member C is confined within the head D, with sufficient float to make the device self-aligning with the holes in the gears.

A relief hole is radially drilled into the burnishing spindle at B3. A small drilled hole extending lengthwise

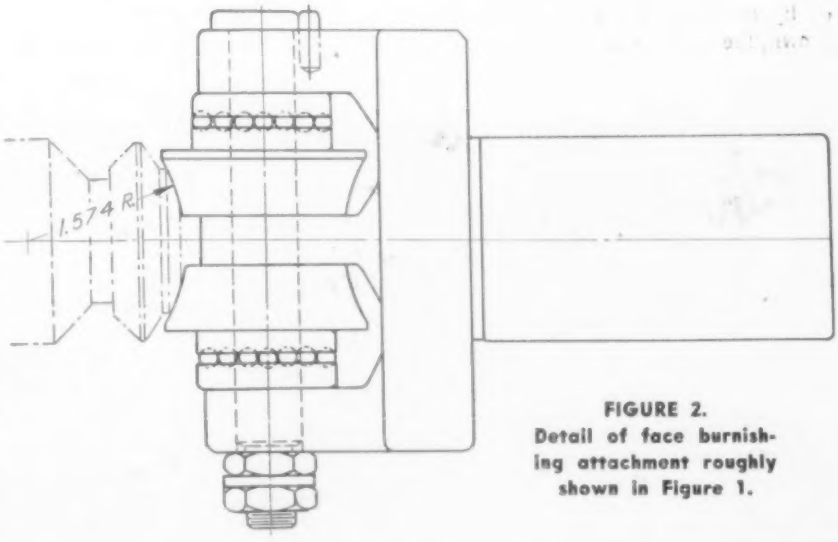


FIGURE 2. Detail of face burnishing attachment roughly shown in Figure 1.

through the capscrew B1 (not shown) intersects with the hole at B3, providing relief for any cutting oil which may be trapped in the gear hole by the burnisher.

CROSS-DRILLING ATTACHMENTS

Cross-drilling on automatic screw machines, when the attachment does not revolve about the axis of the work, obviously necessitates stopping the machine spindle.

The cross-drilling attachment shown in Figure 5 is of the revolving type, and does not require stopping the spindle. It is not universal, rather has limited application, but it cuts costs where applicable. Designed for use with a Cone four-spindle machine only, it is suspended from the top bed frame and supported in a bushed bracket provided for the purpose.

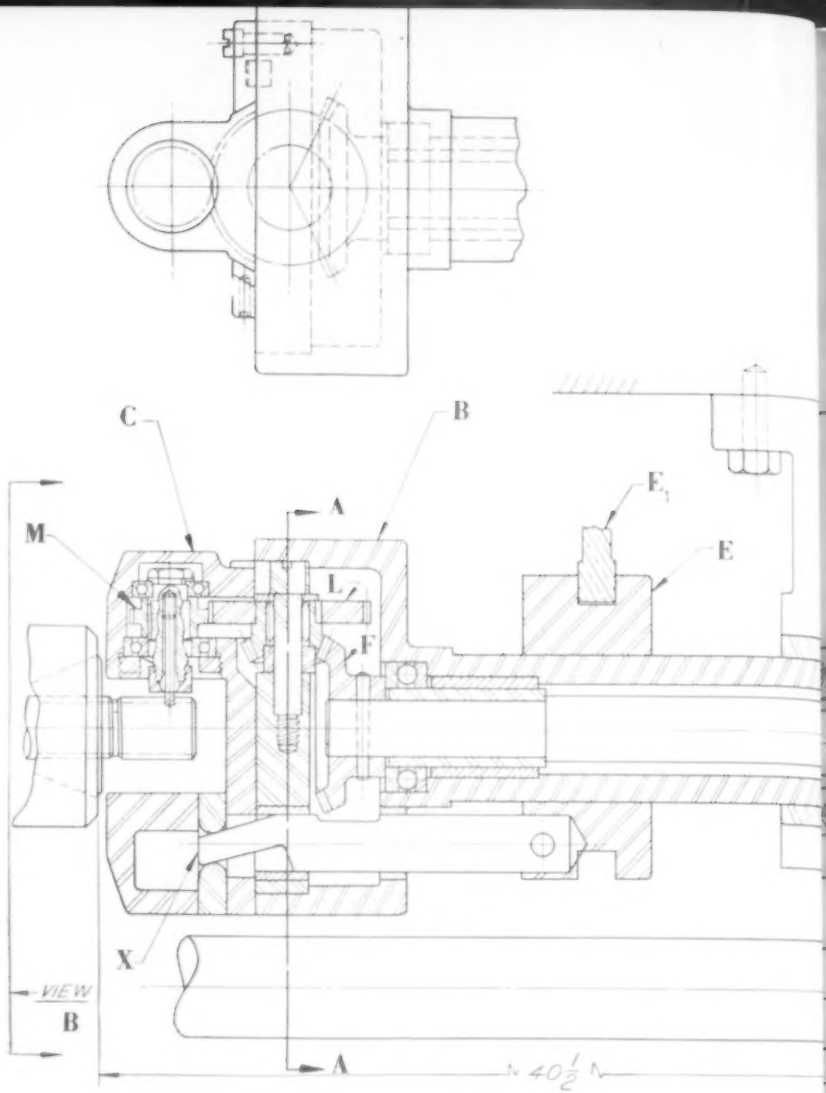
Tracing the construction and operation of this device, as shown in Figure 5, the bevel gear F is pinned on the shaft F1, which is held from rotating by a splined bushing F2 in the wall of the right end column G. (By removing keys, F1 can be rotated to give required surface speed to the cross drill.) The shank of the head B is a hollow spindle which is held in the bushing D1. It is supported by the bracket D which is suspended from the top bed frame.

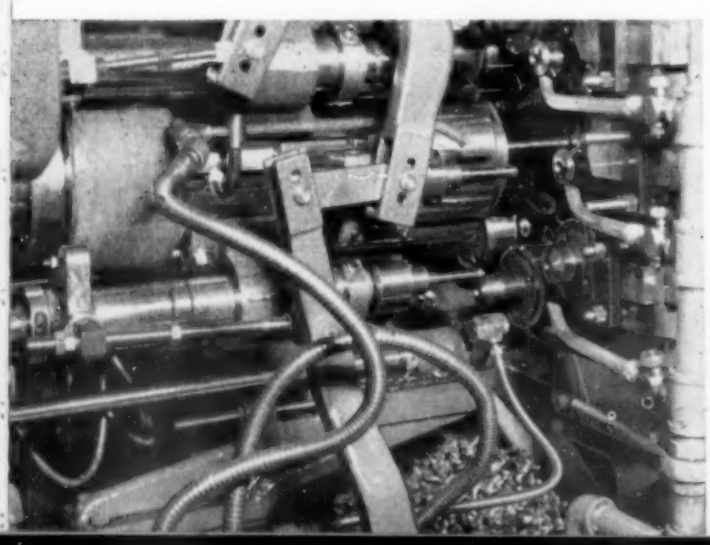
The shank of the head B is coupled at Y to K, simply for convenience in assembly, and to provide circumferential location adjustment of the cross drill. Part K is free to slide in the splined bushing K1, allowing the head to be advanced axially with reference to the work before the cross drill advances radially.

The axial advance and retreat before and after cross-drilling is effected by means of the spool and yoke shown, the spool being indicated as K and the yoke as K2. Actuation of the yoke, of course, is by lever, cam and camroll, from the camshaft.

The arrangement is such that the cross-drilling attachment is suspended in parallelism with the main drive shaft N, and is placed so that a gear carried on the main drive shaft mates with a spur gear H. The gear H, keyed to quill J, drives the head B.

The spur gear L shown inside the head B is keyed to the hub of the small bevel gear shown engaging the mating bevel gear F on the end of the stationary shaft F1. As the head B revolves around the axis of the shaft F1 and the work, the gear cluster L is forced to revolve as it traverses the stationary gear F. Since the small gear M is in mesh with gear L, it must also revolve, and the drill shown revolves with it.





(Left)—**FIGURE 3. Method of mounting and advancing rough and finish burnishing attachments. Uppermost, in seventh position, is tool for roughing.**

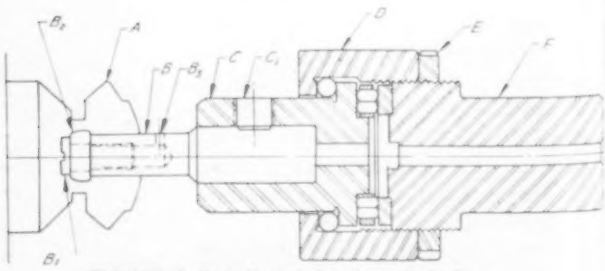


FIGURE 4. Detail showing how hole burnishing attachment is self-centering.

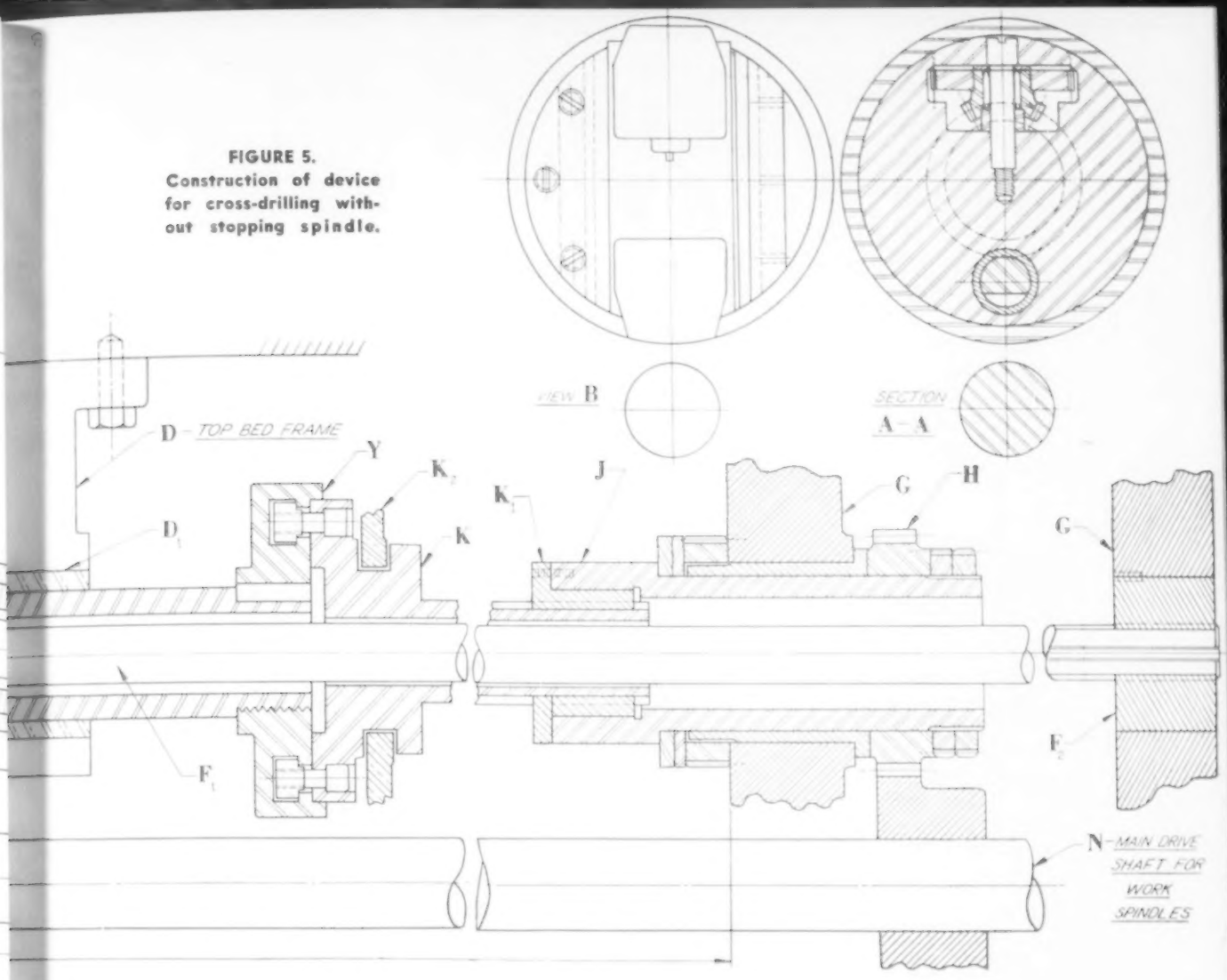


FIGURE 5.
Construction of device for cross-drilling without stopping spindle.

The drill is chucked in a small spindle with collet arrangement, and is supported in the half-head C by two sets of ball bearings, radial to the work. A spool at E, and a shifting yoke for the spool shown at E1, is traversed along the hollow shank of the head B by means of a lever in contact with an independent cam on the camshaft above.

Traversal of the round member attached to the spool E, through the bushed support, actuates the cam arrangement at X, which moves the half-head C on ways provided for the purpose, radial to the work, and causes the revolving drill to enter the work. As this action takes place, there is a sliding action laterally of the gear M on the gear L, and the face of the teeth on L is made sufficiently wider to take care of this action.

When the half-head C is traversed radially on B, there is some off-balance, but the half-head is relatively light in weight. Also, the pressure of the drill against the work minimizes any tendency to whip.

The depth of drilling, as the design stands, is necessarily limited, but the extent of limitation is largely with reference to the rpm. of the work and head B. Since centrifugal force varies with the square of the speed, a modest reduction in rpm. reduces the centrifugal unbalance. (If a case arose in which it was especially important, the design might be altered to include counterbalance.)

ECCENTRIC DRILLING

Another device drills a hole eccentric to the circumference of the work. This, also, is done without stopping the spindle, by holding a drill eccentric to the axis of the toolholder, and swinging it in a circle around that axis. Synchronized with the work, the drill will remain at a given point on the work, off-center to a desired degree. This attachment has been developed for use on a six-spindle Conomatic, in the third end-working position.

Reference to the work cycle, Figure 6, shows that a relatively large hole is counterbored in the first two positions, and in the third position, the smaller, eccentric hole is drilled. To make an attachment that will be adjustable to the required degree of eccentricity, two eccentric sleeves are used, one within the other. The attachment shown is adjustable from 0″ to ¼″ eccentricity.

The schematic drawing, Figure 7, illustrates the principle of adjustable eccentricity. The inner member, incidentally, represents a tool. To make a layout of this kind provide the desired scope of eccentric adjustability, first strike the circle B to represent the circumference of the outer eccentric sleeve. Then strike the small circle D concentric as shown in the center in full line. Draw a light horizontal line through the center at H.

Assuming that the amount of adjustment scope desired equals A, set off the distance A from H to J on the light horizontal line mentioned, and draw in the dotted indication of D by using J as a new center. Now, find a point E on the horizontal line

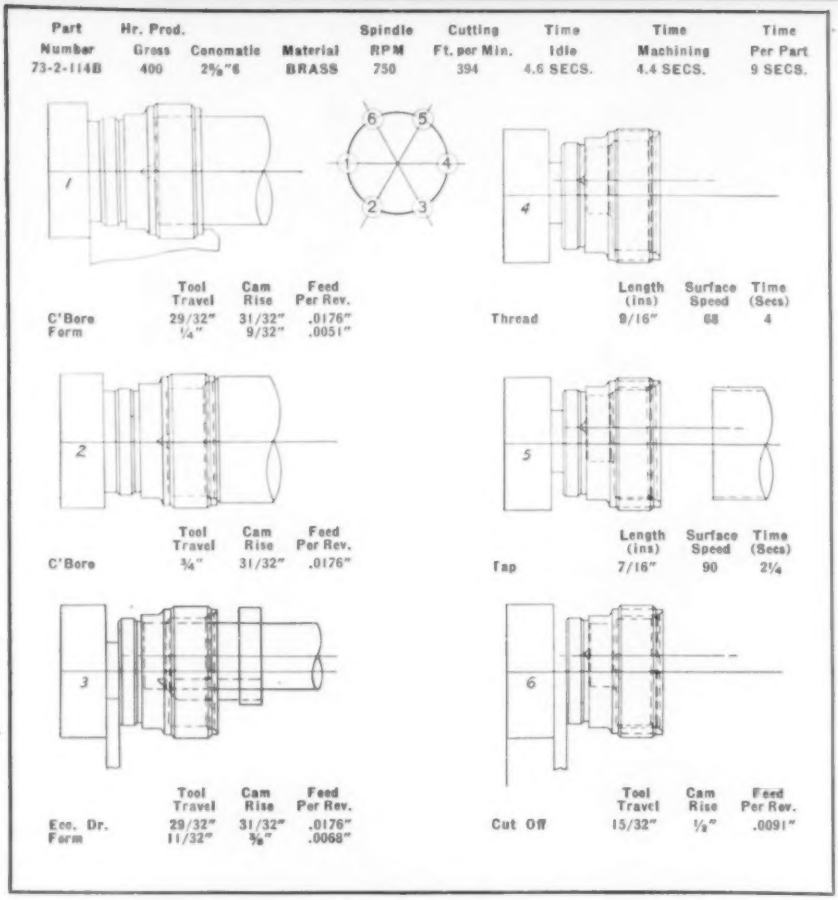

Part Number 73-2-114B
Hr. Prod. Gross 400
Conomatic 2⅝"6
Material BRASS
Spindle RPM 750
Cutting Ft. per Min. 394
Time Idle 4.6 SECS.
Time Machining 4.4 SECS.
Time Per Part 9 SECS.
Tool Travel
Cam Rise
Feed Per Rev.
C'Bore Form 29/32" 1/4" 31/32" 9/32" .0176" .0051"
Thread Length (ins) 9/16" Surface Speed 68 Time (Secs) 4
C'Bore 3/4" 31/32" .0176"
Tap Length (ins) 7/16" Surface Speed 90 Time (Secs) 2¼
Ecc. Dr. Form 29/32" 11/32" 31/32" 3/8" .0176" .0068"
Cut Off 15/32" 1/8" .0091"

FIGURE 6. Work cycle on ordnance part shows eccentric hole drilling attachment in the third end-working position.

exactly halfway between H and J. This point E will be the center from which the circumference of the other eccentric sleeve will be struck.

Regardless of the actual diameter of the member (or circle) C, it will swing about the center E when revolved, for this is its axis, and the adjustment scope will not change. When the inner sleeve C is rotated through 180° within B, the center member D will swing through an arc that will carry it from the solid line, center position, to the dotted line position shown. A device of this kind is infinitely adjustable within its scope.

Figure 8, which is a drawing of the eccentric drilling attachment, shows the drill in position concentric with the work. A dotted line indication is drawn into the workpiece to show maximum eccentricity.

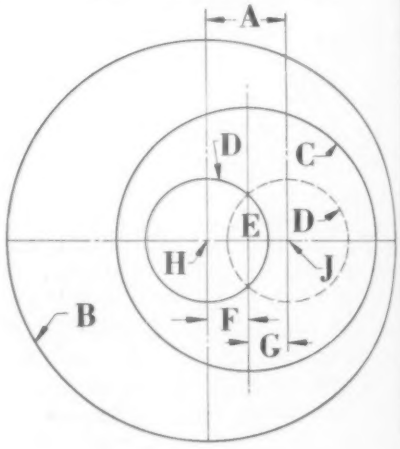
The drill is locked at any desired point by the clamp CX-11515. By means of the long splined shaft extending from the gear box, the eccentric sleeve combination is rotated at exactly the same speed as the work.

The shaft or drill holder CX-11512 (which actually holds the drill) is freed from the sleeve combination by means of the needle roller bearings J-7315. This makes it possible to rotate the sleeve combination without allowing the drill to rotate on its own axis. The drill holder CX-11512 is prevented from rotating about its own axis by the arm CX-11511. Held from rotating about its own axis, the drill simply swings and travels in the same prescribed path, and at the same rate, as does the center of the eccentric hole being drilled.

The arm CX-11511, which holds the drill holder from rotating on its own axis, is free to oscillate in the bracket, and thus to permit the required circular swinging action of the drill. THE END

FIGURE 7.

Principle of adjustable eccentricity is schematically shown here.



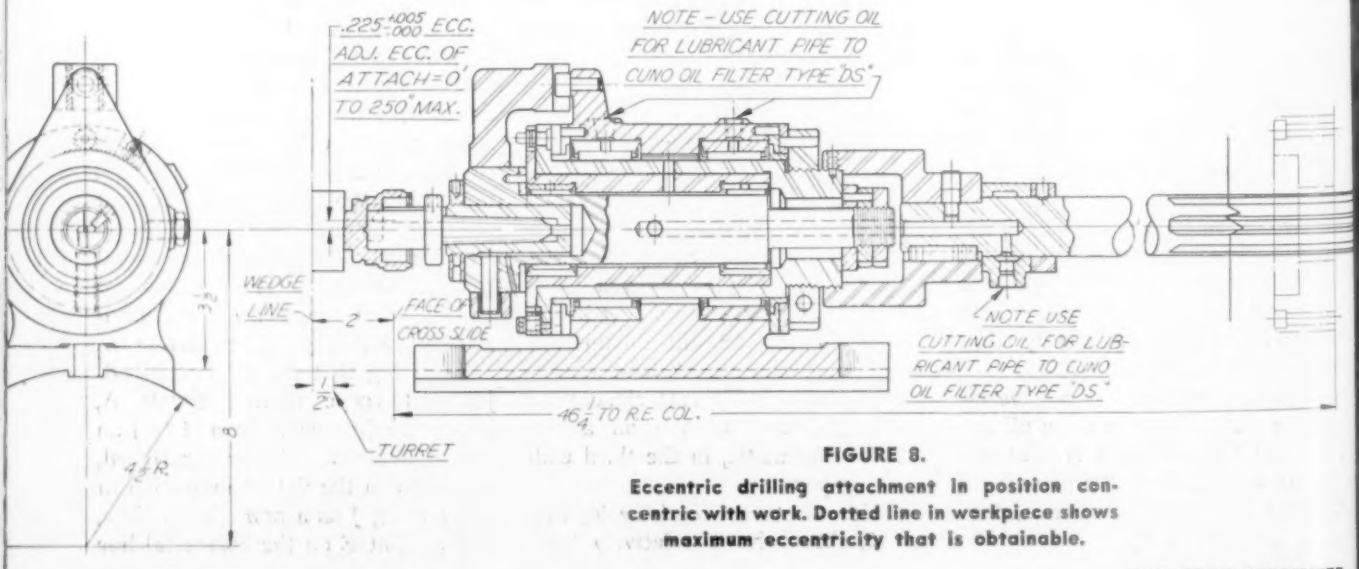
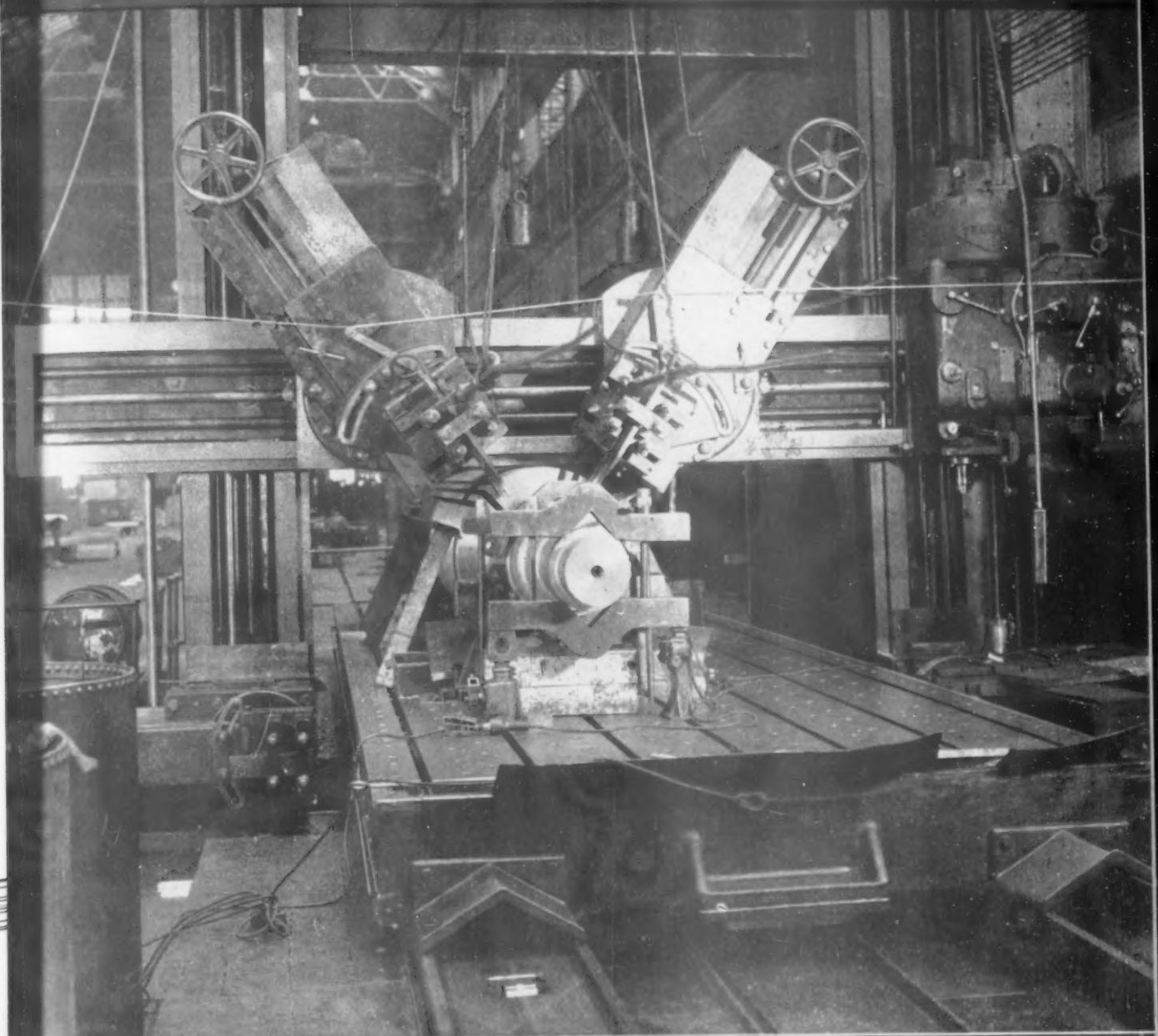

.225 +.005 -.000 ECC.
ADJ. ECC. OF ATTACH=0 TO 2.50" MAX.
NOTE – USE CUTTING OIL FOR LUBRICANT PIPE TO CUNO OIL FILTER TYPE "DS"
WEDGE LINE
FACE OF CROSS SLIDE
NOTE USE CUTTING OIL FOR LUBRICANT PIPE TO CUNO OIL FILTER TYPE "DS."
TURRET
4½ R.
4 1/4 TO R.E. COL.

FIGURE 8.

Eccentric drilling attachment in position concentric with work. Dotted line in workpiece shows maximum eccentricity that is obtainable.

PRODUCTION

MACHINE AND TOOL ENGINEERING



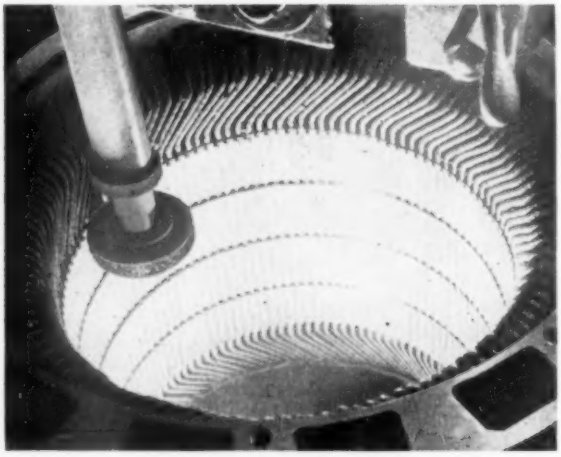
Such basic machines as planers have been modernized at Westinghouse by the addition of automatic devices (see page 80).

"PRODUCTION ECONOMY WITH MODERN METHODS"

Machining, forming, and welding techniques which have streamlined production in the plants of a foremost electrical products manufacturer are featured in this section. Applications range from machining turbine rotors to fabricating small switch parts.

Streamlined Production

PRODUCTION ECONOMY WITH MODERN METHODS



Westinghouse Electric & Manufacturing Company is a war production leader. Described here are applications for increasing output per man-hour of input, for producing more parts per pound of vital material

SPECIAL FEATURE
BY THE EDITORS

Westinghouse photos

Left—**Interior of a large electric motor frame, showing how a grinder head attachment is used on a vertical boring mill for internal grinding of motor laminations.**

THE PRIMARY OBJECTIVE of this series of articles is to present details of broadly applicable "know-how" on a variety of fabricating problems. Today, that objective is reached by showing how war production leaders make the most efficient use of men, materials and machines.

This story on the Westinghouse Electric & Manufacturing Company describes details of machining, stamping, joining and other types of processes. By and large, those details are ample testimony to the way in which the job is being done.

No attempt is made to publicize the broad activities of this company. Not only is this fairly well known among production engineers, but such information tends to defeat the purpose of this series, which is to emphasize methods that have worked successfully on one type job and that can be applied to that type of job regardless of the product.

Certain intangibles, difficult to describe in facts and figures in this space, are largely responsible for Westinghouse production leadership. Of major importance is quality control, which is both a department with men in the various plants, and an attitude toward the job shared by all employees. As a department, quality control considers most aspects of production with the idea of instituting production precision.

This phase of production activity deals in facts and figures concerning particular jobs, with relation to equipment, materials and employee skill. It determines probabilities of meeting or exceeding specifications so that inspection methods can be accurately determined. Proper application of quality control should relieve the inspection departments of needlessly looking for production errors.

As more than a department, quality control is an attitude and a determination to build the product right in the first place.

Another factor worth mention here, both for what it is and because it indicates the range of consideration of manufacturing details, concerns research in production equipment. New machines, tools, and fixtures are tested for their applicability to production problems. Data from these tests is available to company plants, helping them in the selection of efficient production facilities.

Dealing with such factors as these, day in and day out, is a manufacturing headquarters staff which can be tapped for expert opinion and counsel. This staff, which proved to be a valuable source in the selection of material for the present "STREAMLINED PRODUCTION" feature, is responsible for most of the production improvements described on the following pages.

Motor Frames are Machined in Balanced Operations

Drilling motor frame with 3-way horizontal multiple-spindle machine. Portable head and vertical slide are added.

SEVERAL FACTORS account for economy of machining costs in manhours, materials and equipment operation in the plants of the Westinghouse Electric & Manufacturing Company. Through alert purchasing, assisted by a research department, proper basic equipment is selected for a predictable range of work. Ingenious accessory fixtures developed by Westinghouse engineers, electrical, hydraulic and cam controls, and pre-loading jigs, are aids to maintaining peak output. Where applicable, multiple spindle heads and other high production fixtures are utilized.

These mechanical aids are marshalled for efficient production by intelligent balancing of operations and streamlined flow of work. Where helpful, improvisations are made on standard machines to increase the efficiency of particular operations.

An example of the application of most of these factors is shown in the machining set-ups utilized to mill, drill and tap motor frames. Three fixtures, operated by one man, complete these operations. On an automatic dual milling machine, about ¼" is removed from the four motor frame feet. As finished work is carried from beneath momentarily idle spindles, a pre-loaded jig travels on the other end of the table into working position. End mills advance to take ¼" cuts, finishing the surfaces finely and accurately enough to permit using them as locating points in following operations.

Finish milled parts are unloaded and new work is clamped in the jig, ready for the automatically controlled reverse travel of the table. Roller conveyors feed work to table loading positions at each end of the machine.

The operator swings the milled work with a hoist to a three-way, horizontal, multiple-spindle fixture, above which a portable, multiple-spindle head has been added for vertical travel. Here, ½" assembly and mounting holes are drilled—four in the feet, and four on each side for assembling end bells. The portable head is used to drill four smaller holes for assembling the conduit box.

Because the drilling operation is performed with automatic tool advance and feed, the operator has an available interval with which to load and unload the tapping fixture for the next operation, as well as the previously described milling machine.

A two-way, multiple-spindle, horizontal fixture, to which another portable head has been added for horizontal travel, taps holes for mounting end bells and conduit box. In these three operations, balance has been provided by selection of proper equipment and provision of automatic features. Intelligent placement enables a single operator to load and unload all machines, yet maintain fairly continuous operation on all.

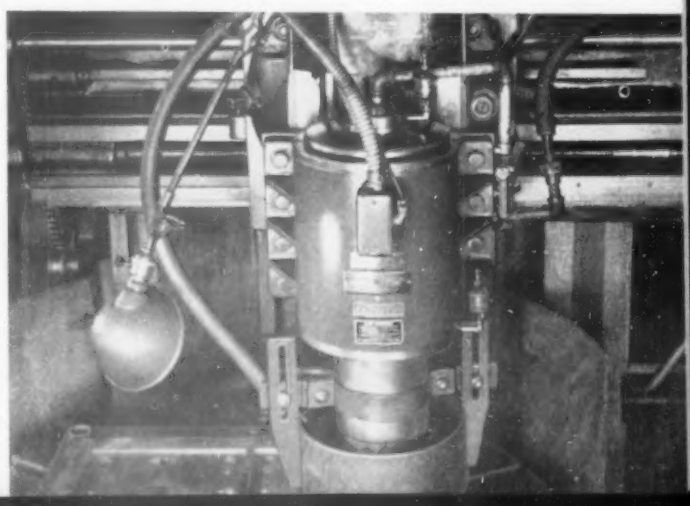
On further machining of motor frames, cam-controlled turret lathes are adaptable to about 25 boring set-ups. After running each set-up to produce a sufficient bank of parts, four to six hours are required to install new tools and to change cam combinations.

Standard drill presses perform a wide range of high production work through the addition of portable multiple spindle heads suited to specific jobs.

Grinder Head on Boring Mill

AN INGENIOUS tool room grinding device has been successfully adapted to production work. An improvisation in the first place, it consists of mounting a head, with power contained, from a standard high production boring machine, on the cross-rail of a vertical boring mill. A grinding wheel on the boring head spindle can then be indexed to any desired angle for sharpening punches and compound dies used in notching rotor and stator laminations. Usual procedure is to grind punches and dies flat, then set the head off a few degrees to develop a slight shear.

On production, this device is used as an internal grinder to finish grind motor and generator stators, after assembly in the frame. The head is mounted on the cross-rail of a 72" boring mill. Following a boring operation on the flange of the motor frame, the grinder is brought into position. Work feed is approximately ½", and spindle speed is 650 rpm. Though there is no requirement here for setting the spindle off perpendicular, the possibility broadens the range of application. As it stands, this set-up saves using a second machine and provides for two operations with one location of the work, and one handling.



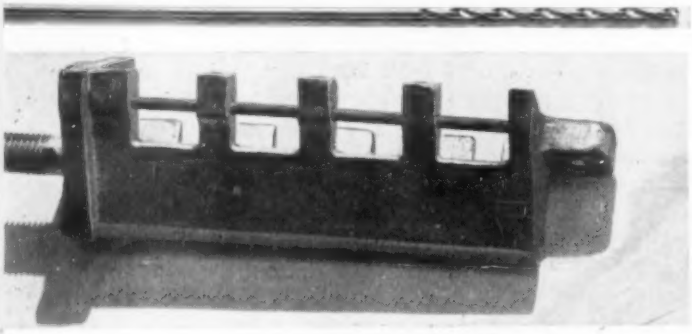
Streamlined Production

Holes Drilled in Aluminum Bronze; Drill Shanks Brazed

TROUBLE ENCOUNTERED in drilling long holes through an aluminum bronze casting has been remedied by a series of improvements. The part, a somewhat unconventional type brush holder, consists of a series of notches, in line, into which motor brushes are set. Intervening metal segments, serving as brush supports, are drilled to provide passage for assembling pins. As originally drilled, from solid, bushings were set in the notches to pilot the thin drills between segments.

Breakage was so great, and the long, thin drills so difficult to obtain, that Westinghouse engineers set about two tasks. First, they investigated means of preventing the excessive breakage, and second, they experimented to produce the required drill sizes in their own shops.

Holes cast in brush holder reduced machining time and drill breakage. Brazing provided supply of scarce drills.



Drilling was simplified and breakage reduced by an ingenious method for coring the holes in the casting. Since steel dies are used, no way seemed open to doing this, because the part could not be separated from the die, following casting, without breaking part or die. But breaking the die is exactly what die designers suggested doing. With inexpensive carbon rods set in place in the die, where holes are required, the part can be removed simply by breaking the rods. Pieces left in the casting can be pushed out with steel pins. Drilling to finish is a matter of removing remaining carbon and straightening the walls.

To supply drills with longer shanks, tool engineers brazed drill rod to short, readily available drills. Both expense and delivery time were reduced.

The rod is drilled to a ¼″ depth, leaving a wall of approximately .031″. The drill shank is then turned down to leave a .002″ clearance when fitted to the rod. Both parts are pre-tinned with silver solder, pressed together and heated carefully with an oxy-acetylene torch. Care must be taken not to overheat. The wall is annealed, but not softened. No holding fixture is required, the parts being held in the hands over the flame. Holding by this method permits twisting slightly to assure even heat.

Important to the success of this operation is a clean fit of the rod against the ground shoulder on the drill shank, as well as careful heating. Attempting to simplify the brazing operation, and relieve the need for the close shoulder fit, experiments were made with a heavier wall on the rod, counterbored to fit over a chamfered shoulder. A good bond was produced more easily, but the strain frequently proved too great on the smaller stud.

However, the care required to tin thoroughly, fit shoulder to rod closely, and heat the thinner wall carefully, are by no means formidable obstacles. Given due recognition, these factors are part of a job which has speeded production approximately 500 per cent and reduced costs.

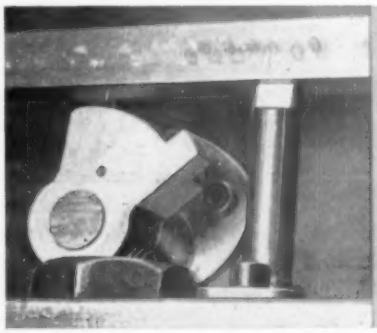
Shaper and Planer Tools Raised Automatically

ONE of the most ingenious of recent Westinghouse developments is a provision for automatically raising the clapper box on a shaper, simultaneously with table return. Contained entirely within the machine, and cam-powered from normal machine action, it has numerous advantages.

It increases tool life by relieving the wear which cutting edges suffer from the return drag over the work. No marks are left on the work, following the final stroke. Concerning this last point, the hand operation usually required to prevent marking is eliminated, and there is the possibility that the operator can be engaged on a second job, thus increasing production.

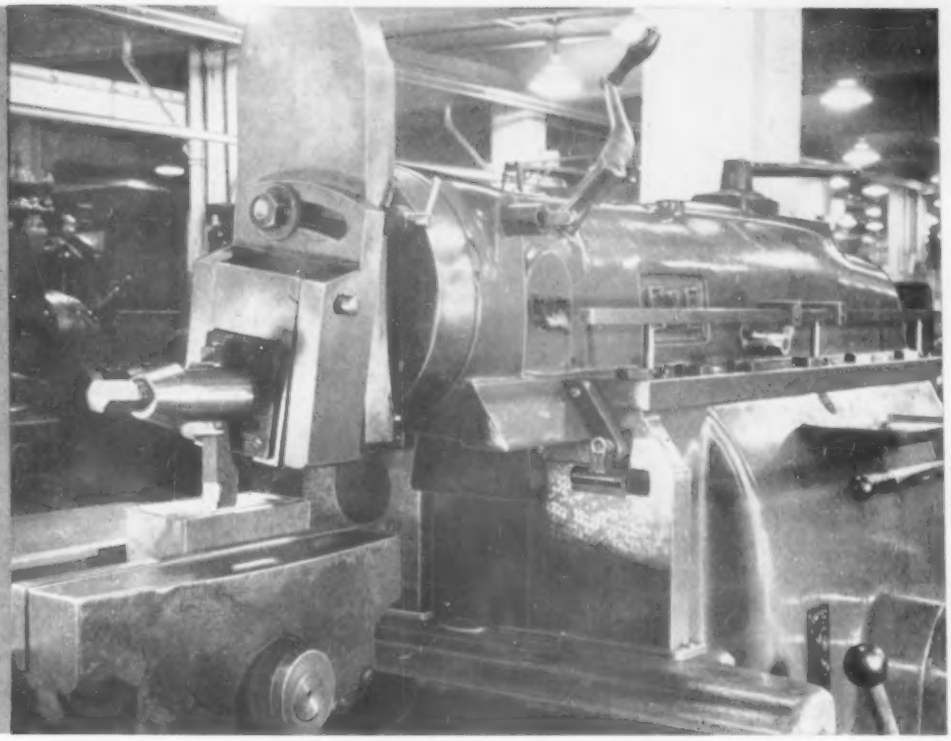
Though full details on this accessory to improved shaper operation cannot be disclosed at present, the facts concerning a similar device used on a planer are available. So that the tool block and holder on a planer may be raised, the block is pivoted from, or hinged, on a heavy pin secured to the apron. Free to swing out and upward, the pressure of the work against the tool holds the block against the apron when cutting.

The mechanism for raising the tool block and holder consists of a hydraulic cylinder and piston, set at an angle at one end of the slide. The piston is connected to the tool block by a lever arrangement, so that as the piston is drawn into the cylinder, the block is raised. Pins at the side of the planer table, adjustable in accordance with table travel, trip a lever connected to a solenoid, which in turn actuates the valve controlling the hydraulic cylinder.



Cam action lifts clapper box on shaper, automatically with the return of table. Increase in tool life is a result.

One application where this device is particularly useful is in machining slots in turbine rotors. Obviously, automatically raising the tool from the work is of great benefit



Device for raising shaper tool has numerous advantages. Contained entirely within the machine, it is powered from normal action of the machine.

In addition to increasing tool life, this provision leaves work clean following final stroke. Operator is also free to handle a second job.

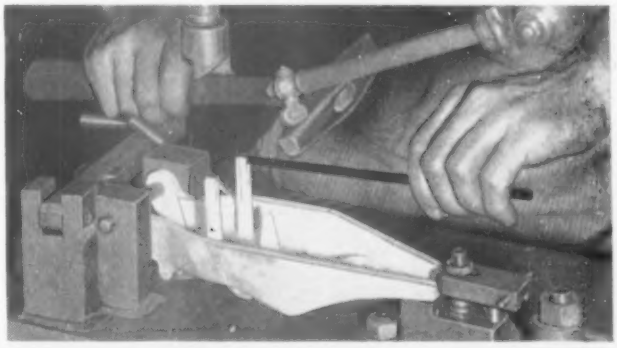
on an operation of this kind. Two aprons are set up on the cross-rail. Working consecutively, they produce a stepped cut or slot.

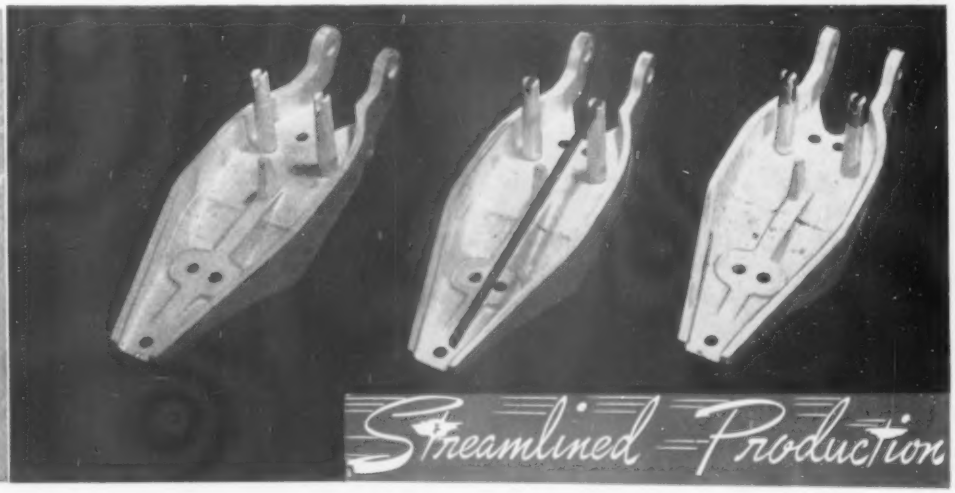
Each tool block carries two tools, the second taking a finishing cut about 1/32″ wider than the first. A groove 3-11/16″ deep by 1″ wide completes the first cut. The second set-up is moved into position to produce a slot ¾″ wide by 1¼″ deep. On this operation, the apron is advanced .010″ for each cut, as the tool block and holder are raised during table return.

Scrap Micarta Solves Problem of Threading Slotted Studs

THREADING a cast slotted stud proved difficult until a new method was developed. Previously, a special tool was required to keep the slot open while the threading operation was performed. A spring plunger was lowered into the slot while the stud was being threaded.

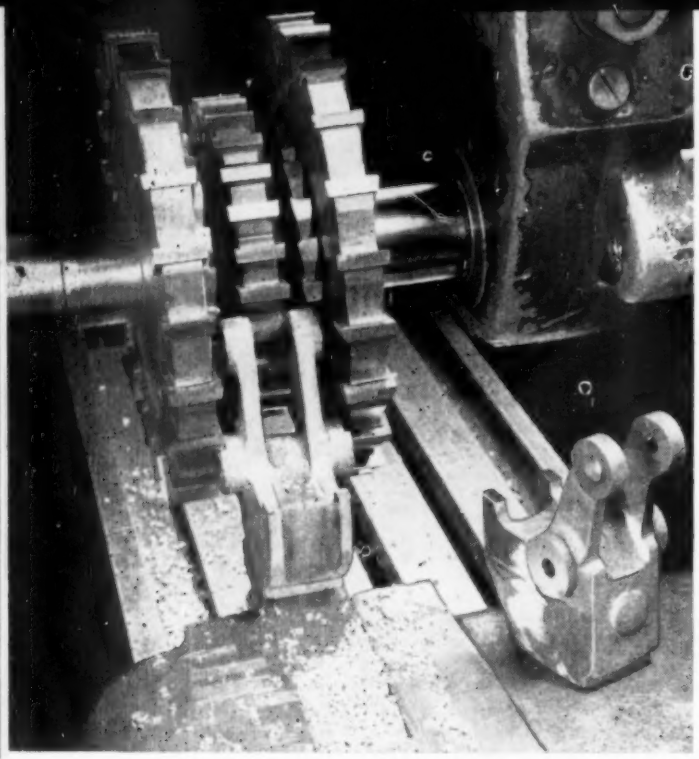
In the new method, a piece of ⅛″ scrap Micarta is wedged in the slot, and a hollow mill is used to mill the stud to size. A three flute button die is then used to thread the stud, after which the Micarta wedge is removed. By this method, the slot is held to correct dimension and there are no burrs on the edges of the slot.





Left to right, studs as cast before machining to size; placing a Micarta slug in slot to protect it from burring or closing; stud with Micarta plugs after threading.

The old method required a special tool.



Using gang set-up to mill toggle levers reduced individual tooling set-ups two thirds.

Streamlined Production

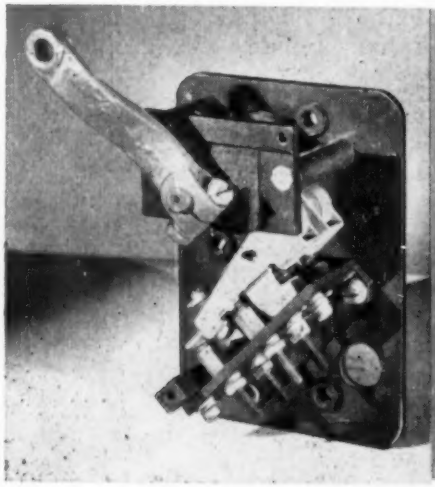
Gang Milling Cutter Set- up Cuts Machining Time

FIVE MILLING CUTTERS have been "ganged" to mill toggle levers in one set-up, a job which formerly required three set-ups. By the old method, the part was put in a fixture and outside bosses were machined. The cutters were then changed and the two upper outside bosses were machined. Finally, the center cutter was set up and two inside faces were machined.

Three machine set-ups and three locations of the work were required. Slight variations in location, and pressure of the cutters causing the part to spring away, made repetitive production of these parts virtually impossible and the machined surfaces were never exactly parallel.

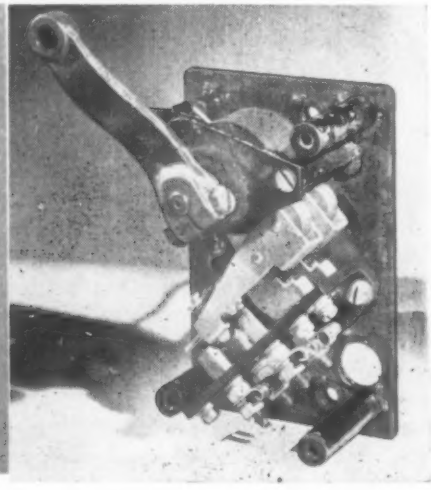
With the new set-up, using five cutters simultaneously, six faces are machined in one operation. Instead of using the old holding fixture, the part is bolted to a bar by the mounting holes that are already drilled and tapped. The new method saves time, and a better product results.

Furnace Brazing Speeds Joining Operation, Improves Product



Left—New limit switch base, showing squared, cold-rolled steel mounting columns as brazed to the base plate.

Right—Old method of fabrication specified welding a column which was round. For assembly, column was milled.



FURNACE BRAZING with copper, silver solder or other brazing metal has enabled Westinghouse engineers to effect numerous production savings. On one part, brazing replaced 22 out of 24 screws required in an assembly. Drilling, tapping and tightening screws were eliminated. Metal also was saved.

In another instance, changing production methods, as well as re-design of certain features, on a limit switch base, reduced manufacturing costs approximately 40 per cent. Most of this saving resulted from the replacement of welding by furnace brazing, and the elimination of a machining operation through a change in specifications.

Originally, the limit switch base was produced by welding mounting columns to a plate. Before welding, flats were milled on the columns, to facilitate a later assembly, and studs were turned down to fit holes in the base plate. Following welding, some parts rejection resulted from contraction of the bead upon cooling, pulling the columns over slightly.

In re-designing this job, the first major change was from welding to copper brazing. The second change consisted of using squared, cold rolled steel mounting columns, eliminating the need for the milling operation. Rounded studs on the ends of the columns are turned for a press fit into the base plate, an operation requiring little if any more care than the previous turning job.

Copper wire is wrapped around the column, at the base, and the parts are set on trays for insertion into the brazing furnace. Brazing takes place in controlled atmosphere at about 2000°F.

Though holding jigs are sometimes required, none are needed for this job. As much as possible, jigs are not used because heat-resisting alloys are required to prevent the jig from distorting and pulling the assembly out of proper adjustment when placed in furnace.

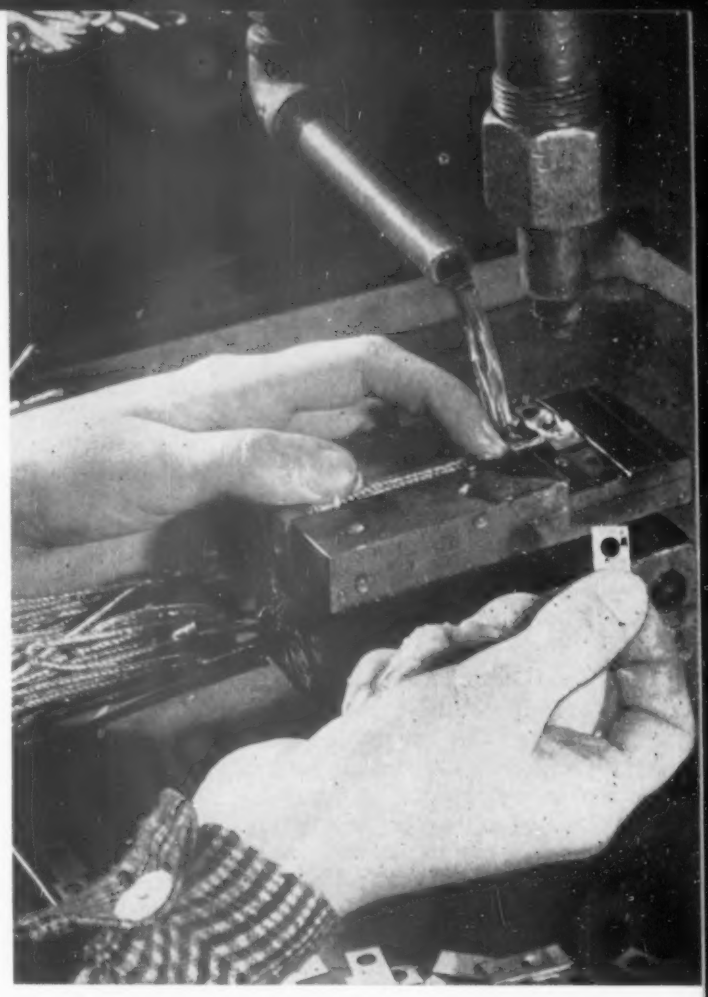
Spot Welding Fixtures Braze Electrical Contacts

PERHAPS the most unorthodox brazing application developed at Westinghouse is the use of spot welding equipment to braze electrical contacts. Timed with Westinghouse sequence and Ignitron controls, low quantities of current are passed through molybdenum electrodes. During a selected time interval, current is pulsated into an accumulation of heat at the joint. Quench is timed with the operation. Pressure of the electrodes is adjusted to be considerably lighter than required for spot welding.

Pulsating low quantities of current permits accumulation of heat at the point of brazing, without heating the electrodes unduly. The molybdenum electrode has proved preferable to copper because so many of the assemblies being brazed consist of a copper member and a bi-metal member, or one of another alloy. No resistance was afforded either in the copper part, or the electrode, and heat was concentrating only in the non-copper item of the assembly.

A detail of electrode construction provides for drilling numerous small holes in the contact end. This reduces surface area, concentrating heat at the point of contact with the work.

A feature of the various assembling operations which are performed by this method is the array of holding jigs which has been devised. After parts have been daubed with silver flux, the lower member is laid in a block grooved to support it, a disc of brazing metal is laid on, the top member held in place, and a quick acting clamp operated to secure the assembly.



Use of spot welding equipment for brazing electrical contacts is one of many unusual Westinghouse ideas.

Induction Heating Solders Metal to Porcelain

INDUCTION HEATING has proven applicable to production soldering. Its use in bonding metal to porcelain has resulted in several small improvements, and in a tremendous production increase.

The job consists of soldering a metal nipple, which serves as an electrical lead, to a porcelain bushing. In order to provide a bonding surface on the porcelain, a platinum band is painted and fired to the porcelain. Before assembling with the metal nipple, this band is thoroughly tinned with solder.

Assembly for soldering is performed by setting the nipple in a holding jig, with the flared cup turned up to receive the bushing. A stainless steel pin, conforming to the internal contours of both parts, is inserted through the bushing and nipple to hold the assembly upright. A ring of solder—blanked out on a press—is slipped over the bushing to rest upon the extended rim of the cup.

By passing the assembly through an induction heating coil on a production basis, the output on this operation has been increased from 450 per day to 20 per minute, or 1,200 an hour. Full advantage is taken of the speed of the induction heating cycle by using a turntable, four feet in diameter. Assemblies are set up around the rim of the table, ready to pass through an oval coil. To permit this passage, each end of the coil is bent upward, affording clearance, yet bringing the assembly within the full magnetic field of the coil as it passes between central turns.

Spot Welding

RESISTANCE, spot and projection welding have proven as much advanced over arc welding as the latter method was an improvement over torch welding. Faster, cleaner, and better jobs result from these applications, wherever used. Frequently, materials are saved.

In welding a flat plate to extend in a diametral plane and slightly over the rim of a steel tube, arc welding required long joints or seams along the inner wall of the tube. By spot welding only at the two junctures of the plate with the rim of the tube, metal and operation time were saved. Just as strong a joint resulted.

Important to the success of this operation was the formation of a radius on the rim. This required a modification of the cut-off operation. The benefit was that of providing a greater concentration of heat at the point of welding, and consequently developing a superior weld.

Streamlined Production

Projection Welding

TIME AND MATERIALS are saved in forming structural angles with a modified projection welding application. Throughout various stages of improvement in bending and welding a 90° angle in an L-section stringer, a common procedure is the blanking of a triangular piece at the point of the proposed bend. After bending, the resulting seam on one face of the stringer was arc welded.

An improvement over this method consisted of blanking, bending, and spot welding a large triangular reinforcement over the joint. Though time was saved, extra metal was required, in addition to the scrap resulting from the blanking operation.

The final change made use of the blanked triangles as reinforcement over the seam. To develop and assure the required strong joint in the smaller area reinforcement, small bosses were raised on one side of the triangle.

By inserting small pins in the blanking die, rounded projections were formed. The projections provided points of high heat concentration, so that greater fusion of the metals resulted. A better weld was also assured because the reinforcement and the bent angle were guaranteed to be of the same metal, and like metals weld more successfully than those of divergent characteristics.

Triangular electrodes are used in this operation, affording quick location, and assured positioning because they can be aligned with the 90° angle of the vertical faces of the work. Consideration of such details saves time.

Two Hinge Parts Produced Simultaneously in Press Operations

IN MANUFACTURING two parts of a hinge from sheet steel, several operations and much metal have been saved through a revised production method. Formerly, the two parts of the hinge were separate production items, with several operations on one item being identical with those performed on the other item.

For both new and old methods, the first operation is the same. From rectangular stock, a rectangular center is pierced and knocked out, leaving stock which can be bent double to form the ears and body of the larger member of the hinge. At this point, however, old and new methods diverge sharply. Where inner and outer sections were formed separately, they are now formed together. Certain press operations are now performed simultaneously on both members.

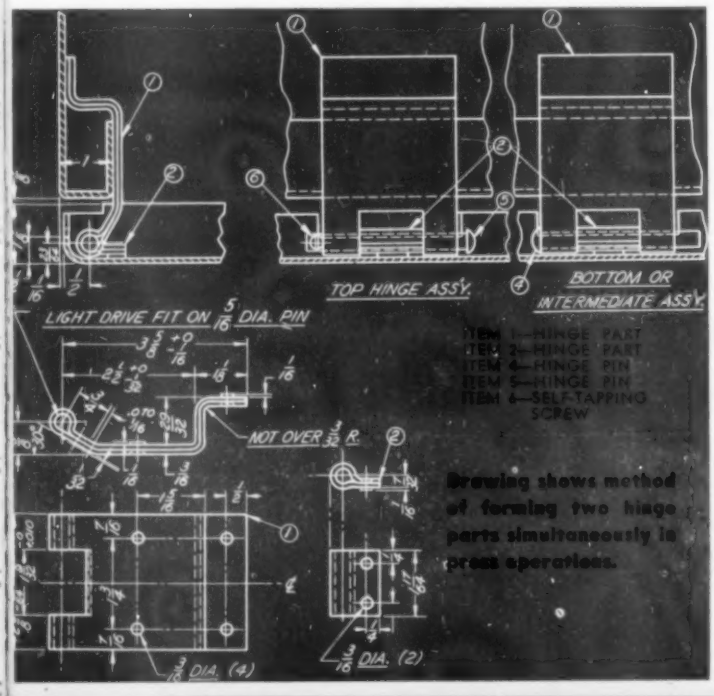
The savings effected by the new method will be quickly appreciated from the following details of the operational sequence. Following the pierce and knockout job, the center blank is forced back into its original position by a a strong spring pad. Based on a center line through inner and outer sections, the work is bent in a U-shape. Next, it is bent flat up to the bolt channel which is formed by continuing the radius developed in bending the U-shape.

Two spot welds are made, one through each ear of the larger member, to prevent the thicknesses from slipping out of alignment in further bending operations. Additional bends are made, one of about 30° just below the ears of the larger member, and a 90° reverse bend at the other end. The center section is then knocked out and machined on one side, about .002" being removed to afford clearance when assembled with the mating part.

In addition to saving duplicate operations on the two parts, a further advantage is realized in improved handling of the smaller member of the hinge. As a part of a larger assembly, it is handled more easily, benefiting from surface area which affords more gripping area in the dies.

In assembling the larger member of the hinge to a metal wall section, a projection weld is made which serves to attach the hinge and to secure the two thicknesses of hinge stock to each other. Pins on the final bending die raise four bosses through the double thickness, so that in spot welding to the wall section, three thicknesses are projection welded together.

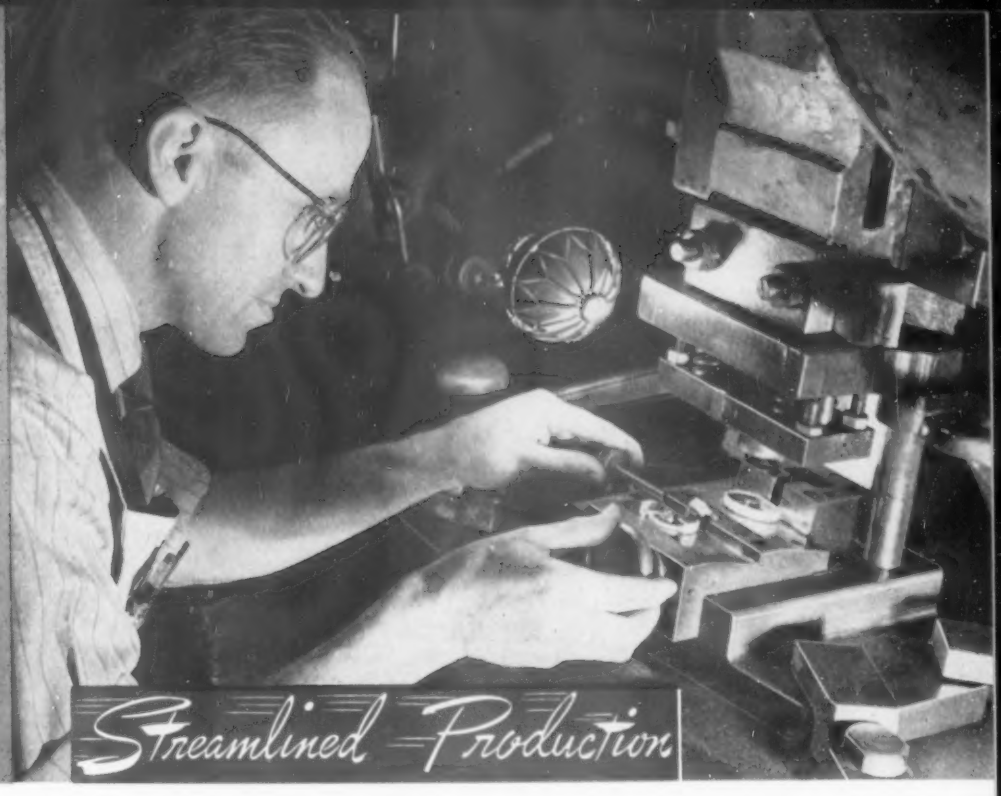
The major feature of projection welding is the tendency for heat to concentrate at the projections. However, because of this tendency, an additional advantage is realized because spot welding electrodes do not need to be located quite as accurately as when projections are not furnished.


TOP HINGE ASSY.
BOTTOM OR INTERMEDIATE ASSY.
LIGHT DRIVE FIT ON 5/16 DIA. PIN
ITEM 1—HINGE PART
ITEM 2—HINGE PART
ITEM 4—HINGE PIN
ITEM 5—HINGE PIN
ITEM 6—SELF-TAPPING SCREW
NOT OVER 3/32 R.
Drawing shows method of forming two hinge parts simultaneously in press operations.
DIA. (4)
DIA. (2)

Indexing Fixture on Press Saves Milling Operations

USE of a novel indexing fixture on a small punch press has made it possible to notch electric switch contact segments on a production basis. Because more than 100 combinations of spacing and segment widths are produced, it was once thought necessary to mill these parts. Universal features on the fixture permit the use of a single punch design. Low activity on any one pattern does not warrant use of individual dies.

With the universal set-up, a few minutes are all that are required to perform a job once timed in hours.



Use of an indexing fixture on punch press saved tedious milling operation in cutting contact segments for electric switch.

Close working worm and gear connections between master and workpiece permit mass production of parts according to exact specifications.

Streamlined Production

Stock for this part consists of a shallow cup, formed from brass, approximately .095″ thick. By notching the low wall of the cup, contact segments are left.

The indexing fixture consists of a suitably strong plate with close working worm and gear connections between two vertical spindles—one on which a master is set and one to carry the workpiece. All cups have a serrated hole punched in the bottom which is keyed over a mating plate around the bottom on the spindle. The workpiece rests in a heel, which supports the curved bottom edges of the part.

The worm gear shank extends in front of the base plate of the fixture, and a knob fastened to it permits the operator to turn the worm and thus rotate both master and work simultaneously. To maintain a close relation between the two, it is important that backlash he held to a minimum.

The master is rotated against a stop. Punch and stop are of a width equal to the smallest space between segments which are produced on this set-up. The stop is secured to a horizontal spindle, so that it can be raised to permit turning segments on the master past the stop position.

The operation is performed by holding the vertical edge of one side of a contact segment against the stop. Then by turning the indexing knob before each stroke of the press, additional metal is removed until the next segment on the circumference of the part is brought up against the stop. The stop is raised, the master turned, stop lowered, and the opposite side of the segment is held against the stop before the punch is lowered.

To compensate for slight backlash, a pin is inserted horizontally through the stop to extend on each side. The distance which the pin extends should be equal to the amount of backlash, as transmitted from the worm and gears to the spindles.

Hot Pressing

CHANGE IN DESIGN and method of producing a bus bar contact plug saved approximately 75 per cent of manufacturing and material costs. Important to the manufacturing requirement with the old method was the use of automatic screw machines.

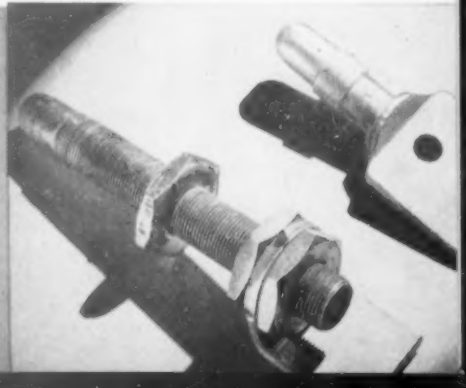
The part is made of copper, and a saving was effected in this critical material by reducing the overall length nearly 50 per cent. As originally designed, the plug was made in two parts—a threaded, headless bolt and a flat angle piece which was secured by brass nuts to the bolt. Two additional brass nuts, serving to retain an ebony asbestos holder in place and to limit the length of the contact area, were brazed in place.

By hot pressing the part in one operation, and in one piece, all assembly machining and brazing operations were eliminated. Use of a Micarta insulated holder between two formed collars eliminated need for brass nuts.

An additional unusually difficult assembly job which was overcome had been encountered because of plating the part. When threaded, plating built up on the threads, not only along the edges, but in varying degree along their length with relation to the anode or cathode. Though plating is still required, threading and assembly have been eliminated.

The hot pressing and trim operation uses a combination forge and punch press, delivering high impact at high velocity. Though this is an essentially low activity job, savings effected warranted the cost of a die.

By hot forming a bus bar contact plug, several machining and assembling operations are eliminated.

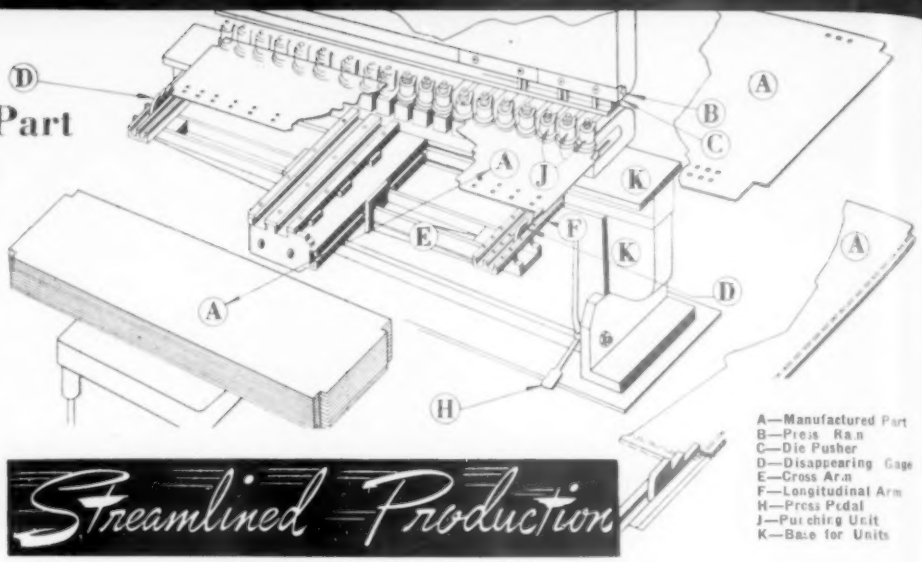


Heavy - Gauge Part is Blanked

A CHANGE IN METHOD of stamping a ventilating grill in the door of a switch gear cabinet saved metal, man-hours, cutting a hole in the door for mounting the grill, and spot-welding the grill in place.

Previous production specifications had called for stamping the grill as a separate item from .070" sheet, because the ⅛" door was considered too thick. Thickness was important in view of the thin web of metal remaining after stamping. When the grill was stamped from a separate sheet, it was necessary to cut an opening in the door and to spot weld the grill over the opening.

Two dies were designed, each blanking alternate squares from the pattern of the finished grill. By staging, the blanking operation was kept within working limits of dies and presses, and undue strain was not imposed on the metal being blanked. Shear on the punches was an important aid. Both dies had an overall area equal to that of the minimum-sized pattern. All grill patterns are multiples of the area of the minimum-sized pattern.



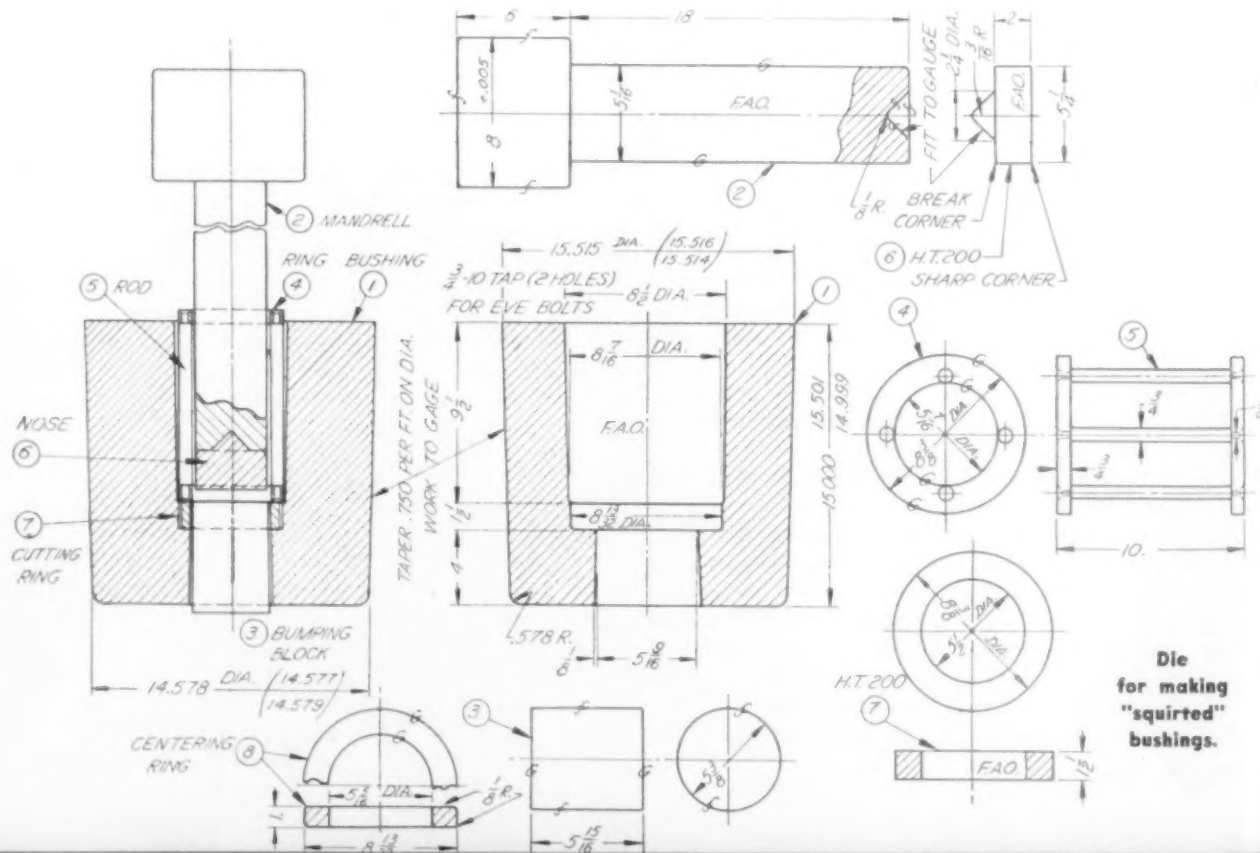
Punching unit on brake press shows how disappearing gages are used. Operator can handle material entirely from the front, has clear vision of aligament. Spring actuation permits sliding work freely over the top of the gages.

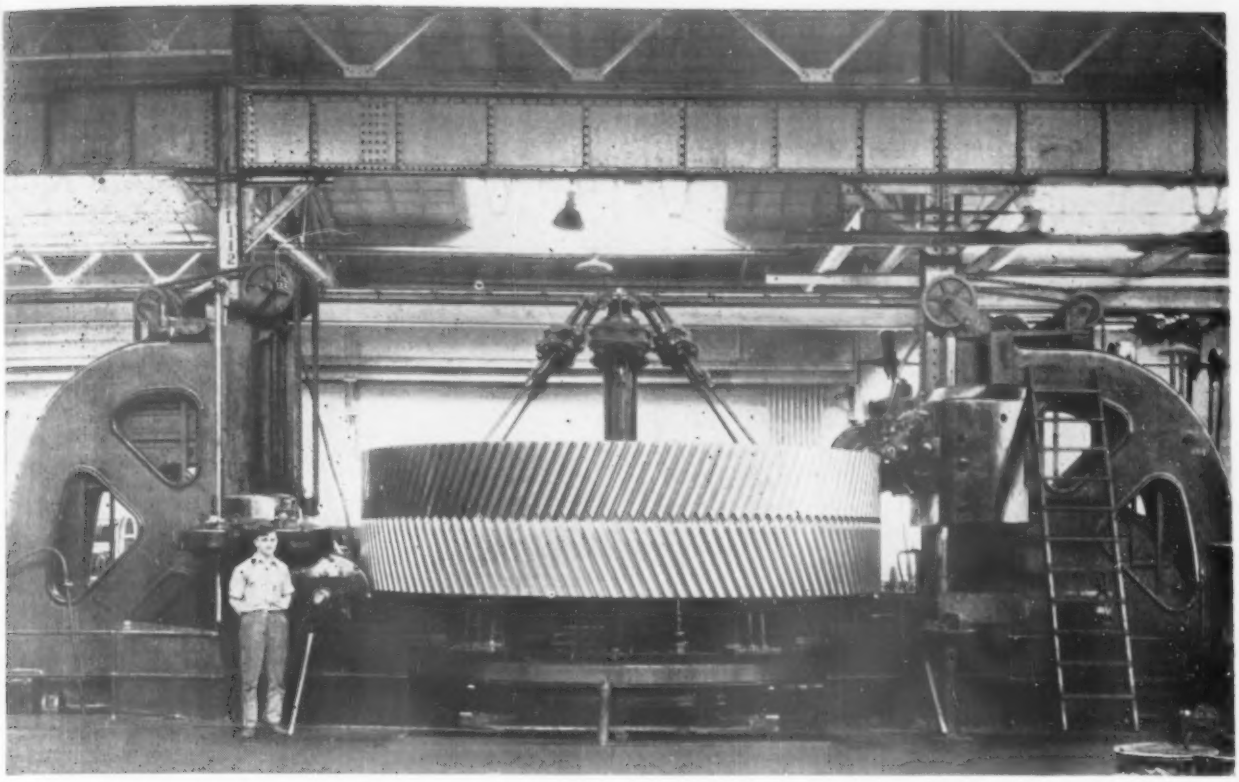
"Squirting" Produces Large - Size Copper Tubing

A DIE has been developed which provides for forming large sized copper tubing from a slug heated to normal forging temperature. On a 1000-ton press, equipped with a tough chrome-nickel plunger, radiators for electronic power tubes are formed quickly and efficiently. Similar to set-ups which have been designed for performing this operation on aluminum, the application to copper required an understanding of copper's physical qualities aside from the conventional attitude taken toward this metal, where forming is under consideration.

Because copper is a "sticky" metal, releasing pressure against it, particularly when hot, is likely to result in pulling it apart as much as in forming it into a desired shape. However, the operation performed on the hot slug through the die shown in the drawing, does not apply pressure on the formation. Pressure on the slug is transmitted through the metal itself, in the desired direction of travel.

THE END





Falk Corporation photos.

FIGURE 1. Falk-built gear hobber cutting 16-foot mill gear. Two hobs of opposite hand are used. One starts at the upper part of the gear and feeds down toward the center, the other starts from the bottom and feeds up.

HEAVY - DUTY GEARS

Large industrial and marine gears are hobbed, shaped and shaved to precise specifications. Important complementary factors are alloy contents, heat treat, fabrication of casings, tests, and assembly

W. P. SCHMITTER
THE FALK CORPORATION

WAR'S IMPACT on the heavy-duty gear field is reflected in a complexity of designs and an enormity of production problems. The number of machines capable of turning out gears up to 12 or 16 feet in diameter, and with operating speeds close to 20,000 rpm., has been decidedly limited. To meet this situation, Falk Corporation continued to build its own machines. For example, a number of double-headed hobbing machines, such as shown in Figure 1, was designed and built.

Some manufacture was contingent upon availability of equipment. In one case, the main gear diameter for a reversing reduction transmission was based on the maximum swing of the 5L Gisholt.

Heavy-duty industrial gears usually are heat-treated before cutting, to obtain maximum accuracy. Any alloy that can be heat-treated to required minimum physicals will perform satisfactorily. NE and other lean alloys have been successfully used. Grades high in carbide-forming elements provide maximum resistance to abrasive types of profile wear.

For large sections, alloy content must be increased to obtain proper response to heat-treatment. For sections which cannot be liquid quenched, because of size or demand for minimum residual stresses, physicals must be obtained by normalizing or tempering; high alloy contents are necessary. Alloy selection is also dependent upon machinability, because of the critical nature of the gear cutting processes.

Small gears are heat treated to maximum hardnesses of approximately 360 Brinell; medium sizes to 235-270 Brinell. For heavily loaded large pinions, which are normalized and tempered, a hardness of 200 to 250 Brinell is usual. Physicals are 100,000 to 125,000 psi. tensile strength, with a minimum yield point of about 80,000 psi. Industrial gears can be made from rolled bars, forgings, or castings. For large gears, castings are superior because of the absence of extreme directional properties.

Manufacturing accuracy vital

Horsepower rating of a gear computed by formulas presumes accuracy of manufacture and assembly. Gear blanks must be accurately turned and bored, and teeth cut to close tolerances. Supporting housings and bearings must be bored straight and true.

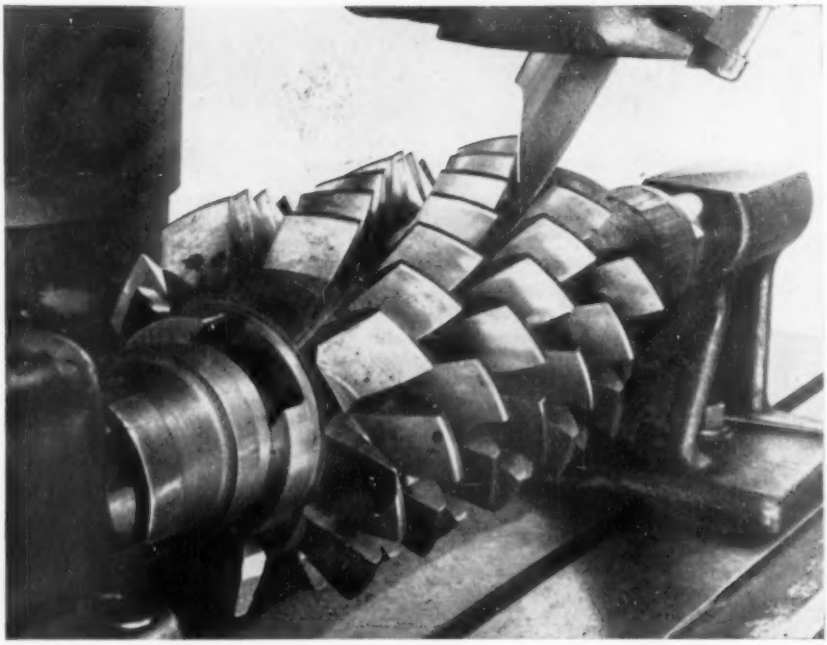


FIGURE 2. Multiple thread hob being sharpened by grinding wheel of special shape. Mechanical means for dressing the wheel is required because the hob must oscillate as the wheel traverses its axis.

Turning, boring and facing of gear blanks are preliminary operations which must be carried out with care. The bore must be square within the face which bolts against the hobbing machine table, to prevent runout.

In some instances, the teeth of large gears are cut after the blank is pressed onto the shaft. Concentricity and parallelism of the pitch cylinder with the axis of rotation will be materially improved if the blank has been turned on its shaft in a pit lathe.

Gear cutting

The foundation of a gear is laid in the primary cutting process, which is either hobbing or shaping. In general, hobbing is considered more accurate and, for that reason, is widely applied in producing large, high speed gearing. The shaping process has the advantage of requiring no gap width for herringbone gears.

The large gear hobbing machine, shown in Figure 1, consists essentially of a table on which the gear blank is mounted, a compensated-differential driving mechanism, uprights carrying the hob saddles, and means for driving the hobs in timed relation to the table and transverse feeding mechanism. The machines are rigid.

Two hobs of opposite hand are used, one starting at the upper part of the gear and feeding down toward the center, and the other starting from the bottom and feeding upward. In the Wuest process, the hob axes are horizontal and at right angles to the axis of the gear. The thread angle of the hob is, therefore, the same as the helix angle of the gear, which has been standardized at 23°. Only within recent years has it been found practical to make hobs of this type.

For correct gear tooth profile, the normal section of the hob tooth must be a compound of the helicoid and involute rather than straight sided, such as is the case with single thread hobs of the inclined type. Wuest type gears are used successfully at pitchline velocities of 10,000 feet per minute. The process has the inherent advantages of hobbing without requiring a wide gap.

When single thread inclined hobs are used, the angle of inclination in the machine is equal to the angle which is to be cut, plus or minus the thread angle of the hob. Hob errors that directly influence the accuracy of the gear are at a minimum with single thread hobbing, though the process requires a rather wide gap. For high speed gears it is seldom a factor.

The hob rotates continuously, working around the circumference and simultaneously feeding across the face at a slow rate, describing a helix. Since the cutting edges are quite close to each other, cutting reactions are uniform and the wind-up and elastic distortions in the machine are maintained at constant values. The relative speed of the hob and blank will not remain constant, however, if alternate hard and soft regions are encountered. This will be reflected in accuracy of tooth spacing. The uniformity of cast gears, in this respect, is undoubtedly one of the chief reasons for their success in the high speed field.

The number of cuts taken in hobbing may vary from one to several. High speed and large rolling mill gears are never finished in a single pass. In the final cut, the machine is not permitted to stop and a light feed is taken to obtain maximum accuracy.

Hobs are carefully ground to a "Class A" tolerance, but correct gear tooth profile will not be obtained unless the hob is sharpened accurately. In the single thread hob, flutes or gashes are parallel with the axis and nearly normal to the hob thread. On the multiple thread jobs, flutes are diagonal, which calls for accurate sharpening as is shown in Figure 2. Mechanical means for dressing the peculiar wheel shape is required because the hob must oscillate as the wheel traverses its axis. Grinding is considered so important that all hobs are checked on a testing machine after sharpening.

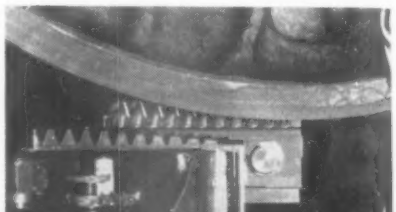


FIGURE 3

Herringbone gears of continuous tooth design can be produced on either rack- or pinion-type cutters.

Shaped gears avoid gap

Herringbone gears of the continuous tooth design can be produced on either rack or pinion cutter machines. One of the latter is shown in Figure 3 cutting a gear for the main turbine of

a large invasion ship. A narrow gap has been provided between the two helices in order to permit shaving. The cutter moves upward with reference to the blank during the process, only the lower teeth being used for finishing.

The lapping process, the most common method of profile refinement, consists of running the gears in mesh using a fine abrasive mixed with a suitable carrier. Before the development of special machines, the pinion and gear were usually lapped by running them in their respective cases or in special bearings set up on parallel bars. Such methods were slow and did not provide for proper control of backlash and tooth contact.

Large marine gears presented a major problem in the design of an efficient, yet simple, lapping machine. A special machine was developed that permits the pinion and gear to mesh in a "cramped" or "tight center" position so that both sides of the teeth are engaged. Pinions are carried between centers on swinging supports so that the cramping pressure and center distance can be accurately controlled to produce the desired tooth pressure for uniform and rapid lapping section.

Whenever the reduction ratio is so high that gear diameter is very large in relation to the pinion, the gear is pre-lapped with cast iron dummy pinions so that mating pinion teeth will not be over-lapped in obtaining final tooth contact. After the teeth are fully lapped, the pinion supports can be moved to obtain the correct center distance position for checking backlash and final tooth bearing.

Principle of gear shaving

The basic principle of the shaving process involves the meshing of gashed or serrated gear teeth in the form of a rack or rotary cutter at crossed-axis with the gear to be finished. The work is rotated at relatively high speed and the cutter fed across the face finish. Shaving cutters are made of hardened high speed steel with tooth profiles ground to master gear tolerances.

Although the rack cutter type machine and early rotary cutter machines were designed primarily for automotive gear finishing, progress has been made on the latter type machines so that they can be applied to shaving speed reducer, commercial, and marine gears. Standard rotary cutter diameter is 20" face width. Figure 4 shows such a machine in use shaving the main gears of a reversing marine drive. Tooth contact and backlash, which must be held to close tolerances, are checked after shaving in a special fixture.

•

Experiments at the Falk Corporation indicate that there is no limit to the size of gears to which shaving may be advantageously applied, unless it be in the unexplored field of coarser-pitched gears, such as are used for rolling mills. Figure 5 shows a large marine gear and its pinion set up in a machine for checking tooth contact after shaving. Profile refinement and correction of tooth spacing is excellent, but shaving should not be expected to correct any appreciable errors in the helical trace.

These large gears are lapped for a short period after shaving to get 100 per cent bearing and the desired intimate contact between the gear and its pinions. It has been found that dummy lapping can be completely eliminated and lapping time reduced to a fraction of that ordinarily required.

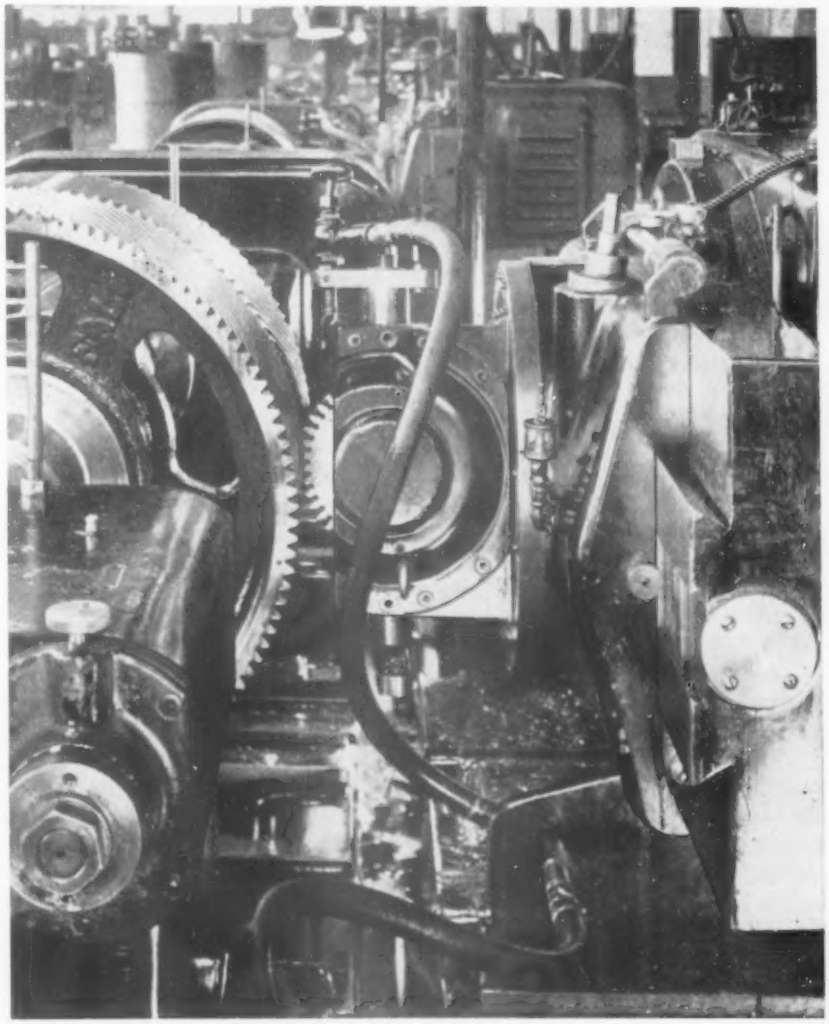
Burnishing beneficial

Burnishing consists of rolling the gear with hardened and ground master gears under heavy load to smooth out surface irregularities and provide a high polish on tooth profiles. Because of the extremely wide face widths on marine gears, it is necessary to feed the narrow burnishing gear across the entire face of the work while the teeth are in mesh.

On a special burnishing machine, load is applied to the meshing teeth by weights through a compound system of levers. The work gear is driven and, in turn, drives the mating master burnishing gears, with the entire

FIGURE 4.

Shaving a marine reverse gear.



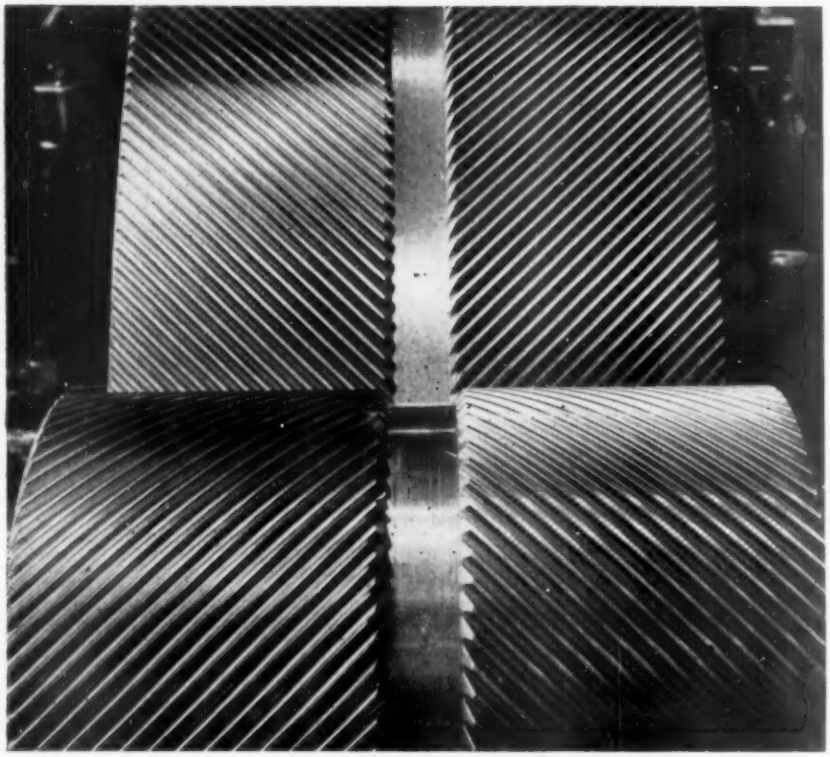


FIGURE 5. Large marine gear and pinion set up for checking tooth contact after shaving. There are few, if any limits, to size of gears which may be shaved.

mechanism traversing across the face of the work gear.

The high finish is imparted to the profiles, together with the superficial work hardening, increases resistance to scuffing and pitting. The rolling process sets up compression stresses in the surface and, since this is in opposite direction to the tensile surface stresses, the critical stress for a given load is correspondingly reduced.

Machining housings

Gear frame boring must be extremely accurate in both horizontal and vertical planes, since any variation will effect load carrying ability and will adversely influence noise level.

Either multiple or individual boring bar set-ups may be used. In the former, accuracy of centers is assured by the fact that the operator can mike simultaneously between bars and all holes bored. When large quantities are involved, high grade boring jigs with Kelly bars are justified. Excellent results can be obtained in boring with a single bar if the machine tool has the necessary accuracy.

Parting line surfaces of gear casings must be machined smooth and flat since the joint must be absolutely oil tight without the use of gaskets.

Assembling and testing

Considerable responsibility for insuring proper operation of a large gear drive falls upon the assembly department. Balancing, final scraping, lapping, hand tapping, and drilling are usually part of its duties. Assembly mechanics must be relied upon to uncover any machining errors which may have passed inspection, but this should not be an excuse for inadequate checking in manufacture.

Final testing is also a function of the assembly department. Gears are blued or copperized to determine contact bearings. Revolving elements are checked for runout with indicators. Backlash is determined by running a lead wire through the mesh or by indicating distance pinion can be rocked when gear is held stationary.

Every detail important

The importance of these operations is apparent from only a superficial examination. The drive cannot deliver its rated horsepower in a satisfactory manner unless all the teeth carry their proper share of load. Undue disturbances and noise will follow if excessive axial or radial runout is present. Bearings will be cramped if checking of bores and necessary scraping is incomplete.

If the gear manufacturer has done a competent job in all departments, the ship can carry out its intended function in the overall war effort, namely, to "deliver the goods" when and where they are needed.

THE END

LARGE GEARS DESIGNED FOR SPECIAL REQUIREMENTS

GEAR DESIGN generally is divided into custom-made and standardized classes. However, war has led to a demand for certain single-purpose gears in such quantities that methods used in producing standard types are being followed.

Typical is the custom-built drive for rolling mill service. The forces imposed on the gears when the slab hits the roll are extremely high, but of short duration. Because shock resistance is a major consideration, the designer generally resorts to mass, coarse pitch, rugged teeth, and tough heat-treated steel.

The load cycle in a hot mill drive also includes a period of rather uniform load transmission during plastication of the material, the load being of a decidedly frictional nature, followed by a period of idling, and then shock, when the next slab hits. In the cold mill, the load is not as intermittent, but somewhat similar conditions prevail.

No satisfactory method has, as yet, been found for integrating these widely varying loads, and equating them to an equivalent nominal load upon which design may be predicated. Experience and judgment must be relied upon to a large degree, with the result that performance obtained is not always uniform or satisfactory. Contrasted to these designs are high speed reducing gears for naval and mercantile vessels. Pitch line velocities frequently attain values in excess of three miles per hour. Emphasis is on surface durability of tooth profiles.

Shaving Aircraft Gears

Approximately 65 per cent of the spur gears produced in the Allison plant have been approved for finishing by shaving. In addition to a complete description of processes preceding shaving, the author reviews the grinding process, and inspection methods employed in precision gear manufacture

SUCCESSFUL OPERATION of the heavily loaded, highly stressed gears in the liquid-cooled Allison engine is the result of intensive development of production and inspection methods.

Most Allison gears are made from forgings of AMS 6250 steel. These forgings are annealed or core treated before machining. A representative number of pieces from each lot bearing the same heat number are sent through the fabricating operations as pilot pieces.

This is done to determine the amount of distortion of critical dimensions to be expected when this particular lot is being fabricated. These pieces, in special containers, are handled by special assignment personnel and, in this way, the regular flow of material in any department is uninterrupted.

Processing spur gears must meet a high standard of quality. This in itself emphasizes the significance of the operations in which the gear teeth are finished. In finishing, both the shaving and grinding methods are employed.

Shaving has been used more extensively for gears of the less critical class, while grinding has been employed for critical gears. Approximately 65 per cent of the spur gears made in the Allison plant have been approved for finishing by shaving. Each method has advantages and disadvantages, and good gears are made by both methods.

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ALLISON DIVISION
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THE SHAVING METHOD of finishing gear teeth was first used in the Allison Division of General Motors to meet increasing production schedules.

Experiments on less critical gears led to the development of a process for finishing certain types of spur gears. Several splined couplings are also being shaved successfully. However, only couplings having sufficient tooth length to afford continuous action when in mesh with the shaving cutter are being shaved by this method.

Although gear shaving has presented many problems, it has offered the following advantages over grinding:

1. Increased production
2. Lower machining costs
3. Less scrap and salvage because reworking of the gear tooth profile on the finishing operation is eliminated.
4. Less skilled personnel is required
5. Elimination of scrap caused by cracks and by grinding gear teeth soft
6. Elimination of need for finishing root radius

Success of the shaving method of finishing gear teeth has been largely dependent upon preceding operations in processing the gears. Proper normalizing of forgings from which blanks are made has been one of the first significant processing operations. Determining expected distortion from each lot of forgings, bearing the same heat number, is another contribution toward successful shaving. After normalizing and processing of pilot pieces, the gear blanks are semi-finish machined. They are then core-treated, by heat and quench, and drawn to a Rockwell 23 to 27C. Finish machining the blanks precedes cutting the gear teeth.

The primary requisite for successful gear shaving is to leave a minimum of errors for correction on the shaving machine. Two operations required before shaving are a rough cut, leaving approximately .040″ on the pin dimension and .025″ on the root diameter, and a finish cut leaving approximately .003″ on the pin dimension to be removed by shaving. The root diameter is finished to size. Single thread Class "A" hobs are used on both operations.

Since quality of production on both these operations directly affects quality after shaving, both hobbing operations are closely checked. The gear tooth profile must be consistently checked to determine tolerances and depth of profile. Tooth spacing, lead, and eccentricity are accurately held on the finish hobbing operation. On gears that are finished by shaving, the root radius must be finished by hobbing. Since this radius must blend smoothly into the tooth profile after shaving, sufficient undercut or clearance must be provided to accommodate the tip of the shaving cutter.

In shaving, gears are located in the same manner and at the same locations as in hobbing. This reduces possible eccentricity when the gear is mounted for shaving and allows it to be shaved while rotating about the same axis on which it was hobbed. Since shaving is affected by pitch, tooth length, tooth depth, and diameter, it is necessary to adapt the operation to each type of gear.

Various cutter speeds and surface feeds must be determined. Roughness of the tooth surface after shaving also must be considered. This is controlled largely by the rate of surface feed while shaving, and the number of idle or polishing strokes the cutter is allowed to make. To control quality of the gears, it is necessary to check tooth profile, tooth spacing, lead and eccentricity.

Gear tooth profile, resulting from shaving, may be unlike that of the hardened gear. Because this profile usually distorts during carburizing and hardening, compensation for this condition is necessary when shaving the gear. The magnitude and direction of this distortion are determined for each type of gear and a correspond-

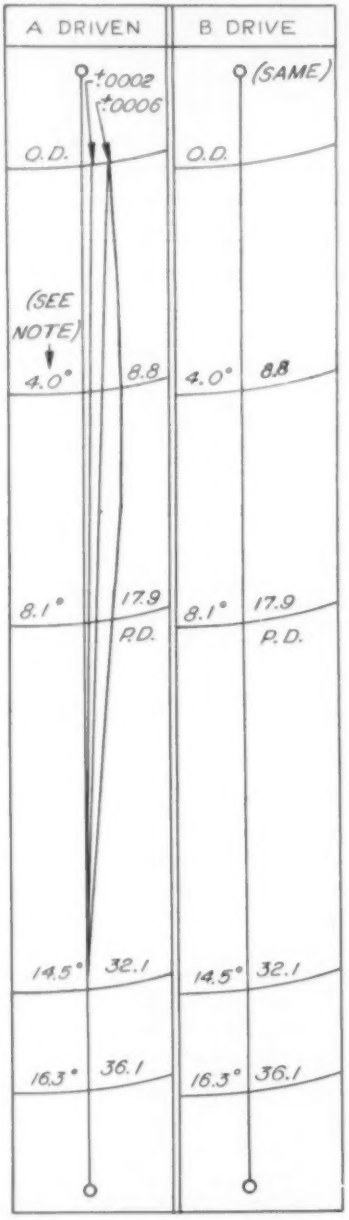


FIGURE 1.
Charts of gear tooth profile when a generator drive gear is shaved. Tolerance is .0002" to .0006" plus at tip of tooth. Pressure angle correction is desirable. Gear has 30 teeth. Spacing tolerance, tooth to tooth, is .0005". Total indicated range is .0008". Lead tolerance, .0003"

ing correction is made in the shaving cutter.

Figure 1 shows charts of the gear tooth profile when the gear is shaved. The tolerance is .0002" to .0006" plus at the tip of the tooth, and a pressure angle correction also is desirable. Figure 2 shows charts of the gear tooth profile for the same gear in its final state. The tolerance here is —.0002" to +.0004" at the tip of the tooth.

Comparison of these two charts shows the effect of carburizing and hardening operations on the involute form. In Figure 1, the profile chart shows a pressure angle correction extending to the tip of the tooth, while Figure 2 shows that this condition no longer exists. The difference is a result of the change in profile during the carburizing and hardening operations. In most cases, this distortion is in the direction noted. The average profile distortion for this gear is .0004", also shown by the charts.

GEAR GRINDING

Highly loaded (critical) gears are finished by two methods—form grinding and generating grinding.

In form grinding, the work is placed between centers on a traversing table that passes the work axially under the grinding wheel which is mounted directly on the spindle. Diamonds used to dress the grinding wheel are actuated by form templates, which also control the form and thickness of the wheel.

The grinding wheel determines profile and thickness of the finish ground gear teeth. In order to maintain a consistent profile, it is imperative to control accurately the distance between the head setting for dressing the wheel and the head setting for finish-grinding the gear. The correct spindle speed in relation to the traversing table speed must be determined to obtain a desired finish and to avoid burning the teeth.

In the generating method of grinding, the work is mounted between centers. For grinding a spur gear, the axis of the work is normal to the spindle on which the grinding wheel is mounted. By the traverse motion of the table to which the centers are attached, the work is rolled under the grinding wheel. This traverse motion, or generating roll, is controlled by means of a master gear and rack. The spindle for the grinding wheel is attached to a ram which traverses the wheel through the work axially.

In this method of grinding, the wheel is dressed to the shape of a rack tooth, generating an involute form as the work is passed under the wheel. This method of grinding is employed for gears which will operate successfully with true involute tooth profile of either a zero curve or a pressure angle correction not requiring a fullness in the curve.

Gears to be ground are finish cut (before hardening) by hobbing or shaping, leaving approximately .005" stock on each side of the gear teeth, or .010" on the chordal tooth thickness. In order that an even amount of stock will be removed from each side of the gear teeth, the work must be placed in the grinder centrally, with the grinding wheel between two gear teeth. Gears are checked for eccentricity before being placed in the grinders, so that the highest portion of the pitch circle can be identified. The grinding wheel is located in this portion to avoid removing an excessive amount of stock the first time around.

The possibility of burning gear teeth is a major problem in gear grinding. This condition prevails more frequently with form grinders than with the generating type because there is more surface contact between the wheel and the work. Preventive factors are: Determining the highest point when starting to grind, selecting the correct grinding wheel and coolant, removing the correct amount of stock each time around on both rough and finish grinding, changing diamonds when necessary, and dressing the wheel at proper intervals.

MAINTAINING ROOT RADIUS

Maintaining a correct root radius and blending it smoothly into the gear tooth profile also is a major problem. This radius is difficult to maintain on the grinding operation unless held accurately when the gear teeth are finish-cut on the hob or shaper. If the radius is ground too small, the case may be too thin at that point. Furthermore, the strength of the gear teeth will be seriously impaired.

This problem has been solved in the Allison plant by using hobs that produce the required root diameter and have sufficient protuberance to assure obtaining the correct root radius. This method of hobbing eliminates grinding in the root diameter

and radius, and simplifies blending into the tooth profile.

GEAR CHECKING

Allison division has contributed to the improvement of gear checking equipment, making it more adaptable to precision methods. But before discussing inspection and inspection procedures, a few peculiarities of Allison's gears are worth consideration. Many critical gears require tooth forms which deviate from a true involute curve, while others loaded relatively high will operate successfully having true involute form but being given a pressure angle correction.

Successful operation of some of Allison's highly stressed gears greatly depends upon these and similar distortions of conventional gear technicalities. Critical gears, as well as less critical ones, are made to operate without scuffing and showing evidence of excessive concentration of load on any portion of the gear tooth surface. Rejections resulting from faulty gear technicalities have been reduced to approximately .02 of one per cent.

Tooth profile, tooth spacing, lead, and eccentricity are vital elements, difficult to maintain in precision gear manufacturing on war-time production schedules. However, a 100 per cent check is made of these technicalities on all critical gears. Each manufacturing department has the necessary gear checking equipment to maintain this control.

All gear tooth profile checking of critical gears is done on involute checking machines using recording units; therefore, for each gear a graphic representation of the tooth form is produced. This check is made immediately following the gear grinding operation. Gears that are ground on grinding arbors must be checked before being loosened from the arbor.

Actual profile can be determined only by obtaining the check while the gear is mounted to rotate about the identical axis on which it was ground. Eccentricity will introduce intolerable variations into the profile check. Four teeth on both sides are checked and recorded. The recorded chart identifies each side of the gear and bears the part and serial numbers of the gear, together with the date and badge number of the operator who made the check.

Tooth spacing must also be checked immediately after grinding. Tooth spacing is checked either by the base pitch method or by a modified form of the more extensively used circular pitch check. Tolerance for tooth spacing of critical gears seldom exceeds .0005" tooth to tooth, and .0008" total indicator reading.

The lead check is significant because an exact lead correction is required for successful operation. The lead correction must be made with respect to the axis when the gear is mounted, using the same locating points as when assembled in the engine. All critical gears are lead checked 100 per cent.

The eccentricity check is also made from an inspection arbor, with locating points the same as those used in assembly of the gear. This check is made by rotating the gear tightly in mesh with a master gear to which is applied spring tension that actuates either an indicator or a recording pen.

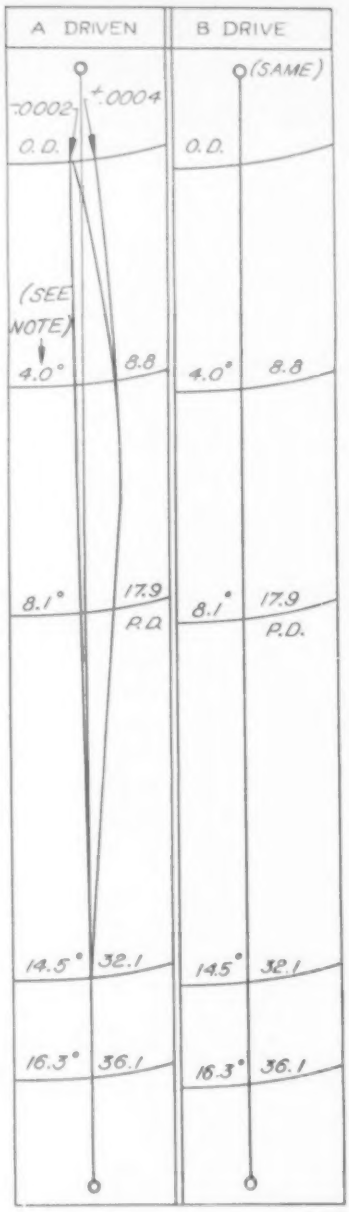
Checking equipment is proved accurate by several systematic methods. Specially ground and calibrated involute masters are used to check the involute machines at approximately two-hour intervals. Lead checking equipment is proved by master alignment bars.

COMPARISON CHECKING

"Comparison checking" is used extensively for checking on both personnel and equipment. Gears that have been checked in the manufacturing departments are chosen at random and taken to the gear laboratory for a complete analysis by experienced personnel and on equipment of known accuracy. In this way an accurate conception of the gear checking in any department can be ascertained immediately.

Another method used to verify the consistent quality of gears coming off the production lines is the "production tryout tests". All the gears required to build an engine are collected from the various final inspection stations and are immediately assembled into an engine. After the required running is completed, the engine is disassembled and the gears are carefully examined.

Other factors that must be checked 100 per cent on all critical gears are Rockwell hardness of the gear teeth, tooth thickness, and root radius. Rockwell hardness is checked by mounting the gears in specially designed fixtures and using checking diamonds that will obtain the hard-



STRAIGHT P. A. CORRECTION TO .0008 PLUS BETWEEN 8.8 & 17.9 UNITS (4.0° TO 8.1°) ACCEPTABLE

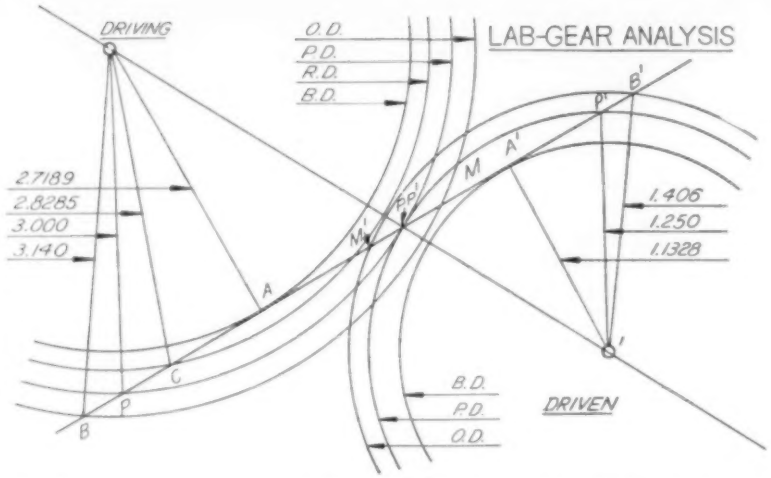
FULLNESS OR HOLLOW NOT TO EXCEED .0002 BETWEEN 17.9 & 36.1 UNITS (8.1° TO 16.3°)

1 UNIT = .0139 ON LINE OF ACTION

NOTE: TIP MUST NOT GO PLUS ABOVE 8.8 UNITS (4.0°)

FIGURE 2.

Charts of final state of same gear tooth profile as shown in Figure 1. Comparison of two charts shows the effect of carburizing and hardening operations on the involute form. Note that the pressure angle correction, extending to the tip of the tooth in Figure 1, no longer exists.



DRIVE **NAME: SHAFT—VIBRATION DAMPER—INNER**

LENGTH OF	EQUALS	MEASUREMENT on B.C.	UNITS	ANGLE	EQUALS	MEASUREMENT on B.C.
AC	.7798	16.432°	56.1	AOC	16°0'10"	16.432°
AP	1.2679	26.717°	91.2	AOP	25° (PO)	26.717°
AB	1.5707	33.098°	11.3	AOB	30°0'50"	33.098°
CP	.4882	10.285°	35.1	COP	8.94°	10.285°
CB	.7910	16.666°	56.9	COB	14°0'40"	16.666°
PB	.3028	6.381°	21.7	POB	5°0'50"	6.381°
MM'	.6122	12.9°	44.			
BASE PITCH	.4745	9.976°	34.1			

DRIVEN **NAME: ACCESS. DRIVE IDLER**

LENGTH OF	EQUALS	MEASUREMENT on B.C.	UNITS	ANGLE	EQUALS	MEASUREMENT on B.C.
A'P'	.5270	26.717°	37.9	A'O'P'	25°	26.717°
A'B'	.8364	42.401°	60.1	A'O'B'	36°0'10"	42.401°
P'B'	.3094	15.684°	22.2	P'O'B'	11°0'10"	15.684°
MM'=PB+P'B'						
MM'	.6122	31.03°	44.			
BASE PITCH	.4745	24.056°	34.1			
OVERLAP=MM'-BASE PITCH						
OVERLAP=	.1376		9.8			

FIGURE 3. Gearing fundamental important to measuring along line-of-action

ness reading on that portion of the gear tooth surface where a maximum of slippage or high unit stress would occur.

Tooth thickness is checked by using either gear checking pins and micrometers or special fixtures employing gear pins and indicators. These checking fixtures have proved to be accurate and afford a much faster check than is obtained with pins and micrometers. Root radius is checked by using comparators that reproduce an image magnified 25 times against a master chart.

A contribution by Allison toward better gear checking equipment was development of the "line-of-action" method of checking and recording gear tooth profiles. Although the best gear checking equipment available was being used, there remained dire need for more accurate analysis of the gear tooth profile of critical gears. To meet this need, the line-of-action unit for use on involute checking machines was developed by Allison's gear laboratory.

Prior to this development, gear tooth profile checking and recording resulted in producing a profile chart representing "degrees roll", or the angle through which the base circle is rotated while checking the profile of a gear tooth. For a pair of mating gears, in which one was relatively large in diameter, the profile charts would be of vastly different lengths. For example, a pair of gears consisting of a twelve tooth gear and a sixty tooth gear would have a base pitch roll of 30 degrees and 6 degrees respectively. One chart would be five times the length of the other.

Since the base pitch is common to each of the two gears when measured along the line-of-action as defined in one of the fundamental laws of gearing, as shown in Figure 3, it is logical reasoning that this line-of-action is the gear technicality to be recorded.

By using the line-of-action method the profile charts obtained for a pair of mating gears would be identical in length, and have equal value per unit of graph paper. This permits superimposing the charts for a pair of mating gears to determine accurately whether adverse profile conditions exist. The effect of profile errors on normal pitch and tooth action resulting from a combination of profile and pitch errors in each gear of a mating pair may be determined.

CHECKING INVOLUTE SPLINES

In addition to the critical gears in the Allison engines, there are many involute splines that are highly loaded. These splines are made in accordance with the theory of gearing, and are checked much the same as gears. Tooth profiles are checked by using the same machines that are used for checking the profile of gear teeth. Much special equipment has been designed for use in these machines when checking internal splines.

Tooth spacing is checked by a modified circular pitch check to obtain indicator readings, which must be corrected for a true zero reading. The curve obtained by plotting these corrected readings about the axis will contain not only the actual tooth spacing error, but also any variation that would have been introduced by eccentricity in mounting the part for checking.

In order to differentiate between actual tooth spacing error and eccentricity, a true sine curve is plotted about the axis indicated in the corrected indicator reading. The difference between these two curves would represent the actual tooth spacing. Additional checking is done by using involute spline gages.

THE END.

An old Twenty-Five Cent piece carries a message for American Manufacturers

PERHAPS you have a 1909 quarter in your pocket right now. Look at it. In one claw the American eagle holds a bundle of arrows, in the other, an olive branch—ready for war—ready for peace!

Our nation didn't follow this advice to the letter. We were not ready for war. But we made up for lost time. America's might will prevent the world being ruled by Japs and Nazis.

We must not make another mistake and be unprepared for peace. What we do after this war to help a stricken world will be as important as our leadership and industry during this war.

If private industry anticipates the vast postwar demands which will fall upon American industry, and plans for it now, there will be work and jobs for millions of returned soldiers and ex-war workers.

In a great reconversion program, American industry will need manpower—womanpower—and skilled management. It will need new machines, new tools, and new methods.

A recent survey indicated that major industry groups plan to spend over 2¼ billion dollars for reconversion and modernization. Of this sum 47.7% is allocated for new equipment, 26.4% to replace old equipment, 25.9% to repair old equipment. A manufacturer who handicaps his workers on production lines with outmoded, inefficient equipment and machines will be left far behind in fast-moving postwar competition.

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YOU CAN TURN IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

Industry's new tooth ...is sharpened with

DI-MET DIAMOND ABRASIVE WHEELS

NOT so many years ago high speed steel almost universally supplanted carbon steels for cutting tools. Now industry has new cutting teeth far more efficient and productive than even the "high speed" tools. Due to their extreme hardness, cemented carbides successfully machine all types of metals with a speed and efficiency never before attained. In fact, their hardness almost *demands* the use of diamond wheels to quickly and accurately grind the keen, smooth cutting edges so vital to high production.

DI-MET resinoid bonded diamond abrasive wheels were specially developed for carbide applications. Their super-tough, wear-resistant resinoid bond cuts fast and cool, resists severe abuse without cracking or chipping and will not craze the carbide surfaces. Smooth, finished cutting edges are easily obtained without subsequent honing and, because DI-MET wheels maintain their size over long periods, accurate sizing of multiple toothed cutters is automatically produced without individual gauging of the separate teeth.

DI-MET resinoid bonded diamond abrasive wheels are highly economical on all carbide applications because of their extra long life, rapid metal removing ability and more accurate grinding results. Made in all standard types and sizes up to and including 6" in diameter. Our new catalog illustrates types, lists sizes and prices and offers valuable diamond wheel operating tips. Write for your free copy.

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MANUFACTURERS OF DIAMOND ABRASIVE WHEELS

PRODUCTION DATA SHEET

RECOMMENDED CYLINDER SIZES FOR OPERATION OF STANDARD CHUCKS

●

3-JAW CHUCKS

Size of Chuck	Size of Cylinder	Theoretical Clamping Force at 80 Lb. Pressure
6"	3-4½	1130— 2544
8"	6-8	5087— 9047
10"	6-8	5369— 9549
12"	10-12	18063— 26013
15"	12-14	30537— 41563
18"	14-16	49260— 64340
21"	14-18	61575—101750
24"	14-20	61575—125660

2-JAW CHUCKS

6"	3-4½	847— 1908
8"	6-8	3956— 7036
10"	8-10	7036— 10995
12"	10-12	10995— 15834
15"	12-14	18096— 24630
18"	14-16	18096— 32170

Courtesy, Logansport Machine, Incorporated.

THOUGH the recommendations indicated on this page are broadly correct, there are exceptional chucking operations which permit the use of a smaller size cylinder or a larger size cylinder than is recommended here for a particular chuck.

For example, a light chucking operation may be applied to work of large, bulky nature. Naturally, a chuck large enough to accommodate the work is required, though only a small amount of drawbar pressure need be specified.

On the other hand, the part may be small, requiring a small chuck, but the machining operation may be difficult, demanding extremely heavy drawbar pressure, and thus a larger cylinder than normally recommended would be required.

●

On all chucking applications, a suitable air reducing valve should be used in connection with air circuits, and suitable hydraulic relief valves should be used in connection with hydraulic circuits. These permit adjustment of actual line pressure, in accordance with the drawbar pressure required to hold the work as securely as demanded by the job.

NOTE: On this page is the twenty-seventh of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

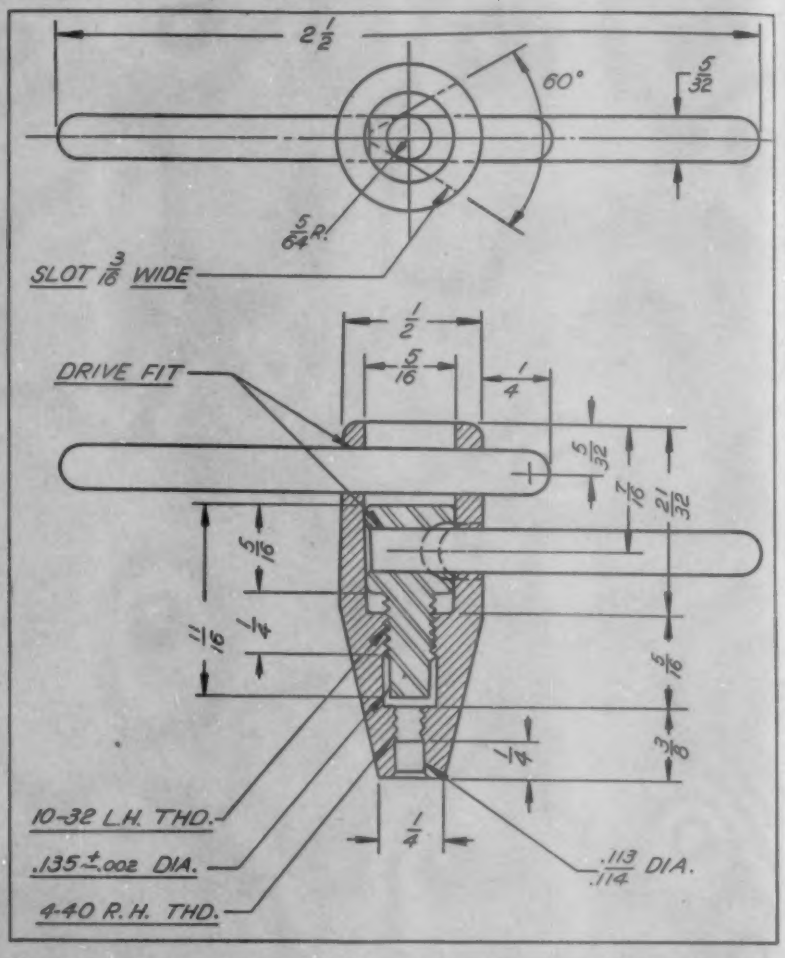
THE CRIB

T. M. REG. U. S. PAT. OFF.

IDEAS · KINKS · SHORT CUTS

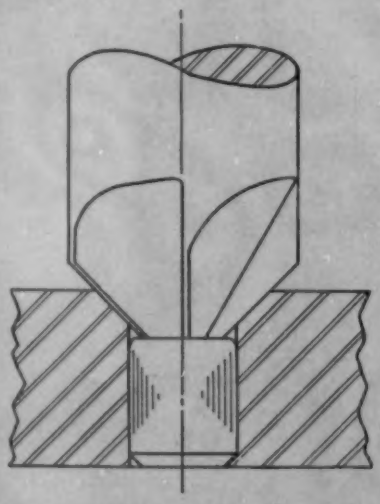
Stud Driver Prevents Backing Off

AN INEXPENSIVE threaded driver tightens studs and prevents their backing off. Center part contains a threaded screw, left-hand, with handle protruding through a slot that permits 60° movement. Stud to be driven is inserted against center screw and driven tight. To release tool without backing off stud, the center stud in the tool is turned by the second handle, continuing in the same direction. Left-hand threading releases the tool without disturbing the stud.



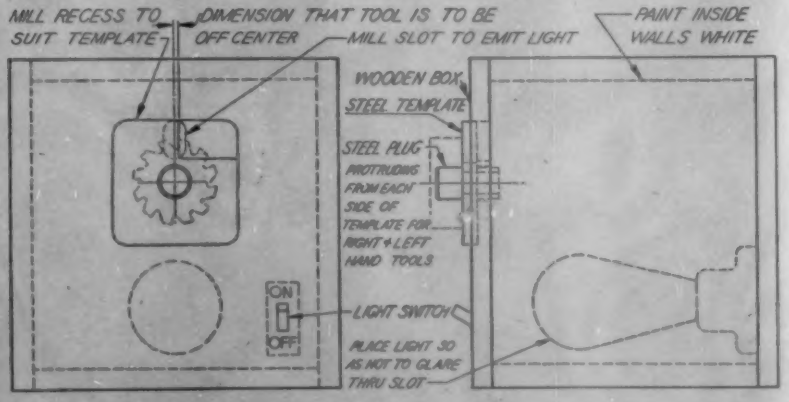
Countersinking to Specified Dimension

ON LOW PRODUCTION, it is possible to countersink to specified depths by inserting a pilot which will strike against the drill table. This idea is also applicable to spotfacing or form-reaming, if the cut may be located in relation to the lower face of the work.



Sight Gage Checks Rake Angles

SIGHT GAGE for quick checking offset dimension and rake angles on hobs and circular form tools can be made of 3/8" cold finished steel. Bore plate to receive shouldered stud. Cut upper right hand corner; grind step to required dimension off center or to angle desired. Place gage on wooden box provided with slot to emit light. Rotate tool on stud to bring cutting edge in alignment with gage ground edge.


MILL RECESS TO SUIT TEMPLATE
DIMENSION THAT TOOL IS TO BE OFF CENTER
MILL SLOT TO EMIT LIGHT
PAINT INSIDE WALLS WHITE
WOODEN BOX
STEEL TEMPLATE
STEEL PLUG PROTRUDING FROM EACH SIDE OF TEMPLATE FOR RIGHT & LEFT HAND TOOLS
ON
OFF
LIGHT SWITCH
PLACE LIGHT SO AS NOT TO GLARE THRU SLOT

● Have you ever made notes on some of your "know-how" items — or perhaps drawn sketches on a paper napkin—only to throw or give them away?

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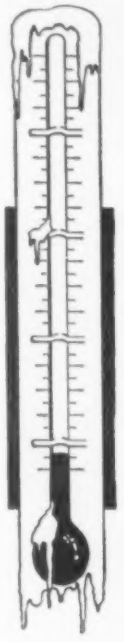
Send your time-and-material savers to The Bramson Publishing Company, 2842 W. Grand Blvd., Detroit 2, Mich.

SUB-ZERO REFRIGERATION

Developing a More Completely Heat-Treated Structure

•Tool life and performance are improved through incorporation of a refrigeration cycle in the heat-treating process. This discussion includes results and methods of sub-zero treatment on various alloys and metal-cutting applications. It foresees broad development of the process for complete treatment of many types of metal products.



G. B. BERLIEN
CHIEF METALLURGIST
LINDBERG STEEL TREATING COMPANY

BECAUSE conventional heat-treatment frequently has failed to develop a uniform structure in tool steels, metallurgists are now supplementing those processes with sub-zero treatment. Experimentally, they have used temperatures varying from approximately 90° below zero to 310° below zero F.

Temperature range was narrowed down, after an examination of critical transformation, until it was found that within the range of from 80° below zero to about 130° below zero, all the changes that could be expected occurred. Average temperatures were 100° to 120°.

The first refrigerants used were liquefied gases and solid CO_2, or dry ice, but their use was not convenient enough to induce much more than academic interest.

Today, required temperatures can be reached by mechanical means, and interest has suddenly revived. More and more places are using this treatment along with conventional heat treating processes.

Early investigators had little idea as to exactly what occurred when various steels were refrigerated sufficiently, though they knew a change was taking place.

Change was difficult to find by microscope, although some steels showed it conclusively. Magnetic measurements and size measurements first really showed what might be occurring. A happy discovery was finding that hardnesses were improved.

DUCTILITY INCREASED

As early as 1914, 18-8 stainless steel was refrigerated to develop spring properties for submarine use. Hatch covers required a spring that would stand salt water corrosion. Such spring properties could be induced by refrigeration, but in traveling from cold water to warm water a few times, the spring qualities were gradually lost.

Investigation was carried further on other alloyed steels. Tool steels have been benefited greatly from this research. Today's refrigeration processes are applicable to both tungsten 18-4-1, the 18-4-1-4 cobalt steels, (or even higher in cobalt), and the familiar molybdenum high-speed analyses.

Improvement in hardness was first questioned as possibly developing such a brittle condition that tools would be almost useless. But impact specimens showed that ductility, as well as hardness, could be substantially increased.

Steels, when first refrigerated, had a high enough hardness so that the ductility factor was somewhat impaired, and a tempering operation, therefore, was included.

If 18-4-1 high speed steel was hardened at about 2340° F., experimentation showed that the critical point would be about 110° below zero. At this point, hardness and size increased, and magnetic qualities improved. In attaining this low temperature critical point, a continuous cooling rate from the hardening temperature down to 110° below zero, or lower, was an important factor.

CONTINUOUS CYCLE NEEDED

Steels are selected and conventionally hardened. They are given one or two preheats, whichever the practice might be, and then brought up to the regular hardening temperatures, either in atmosphere-controlled furnaces or conventional open fire or salt bath, and then quenched in oil, lead or salt, cooled in air to about 200° F., and then transferred to a refrigerating medium.

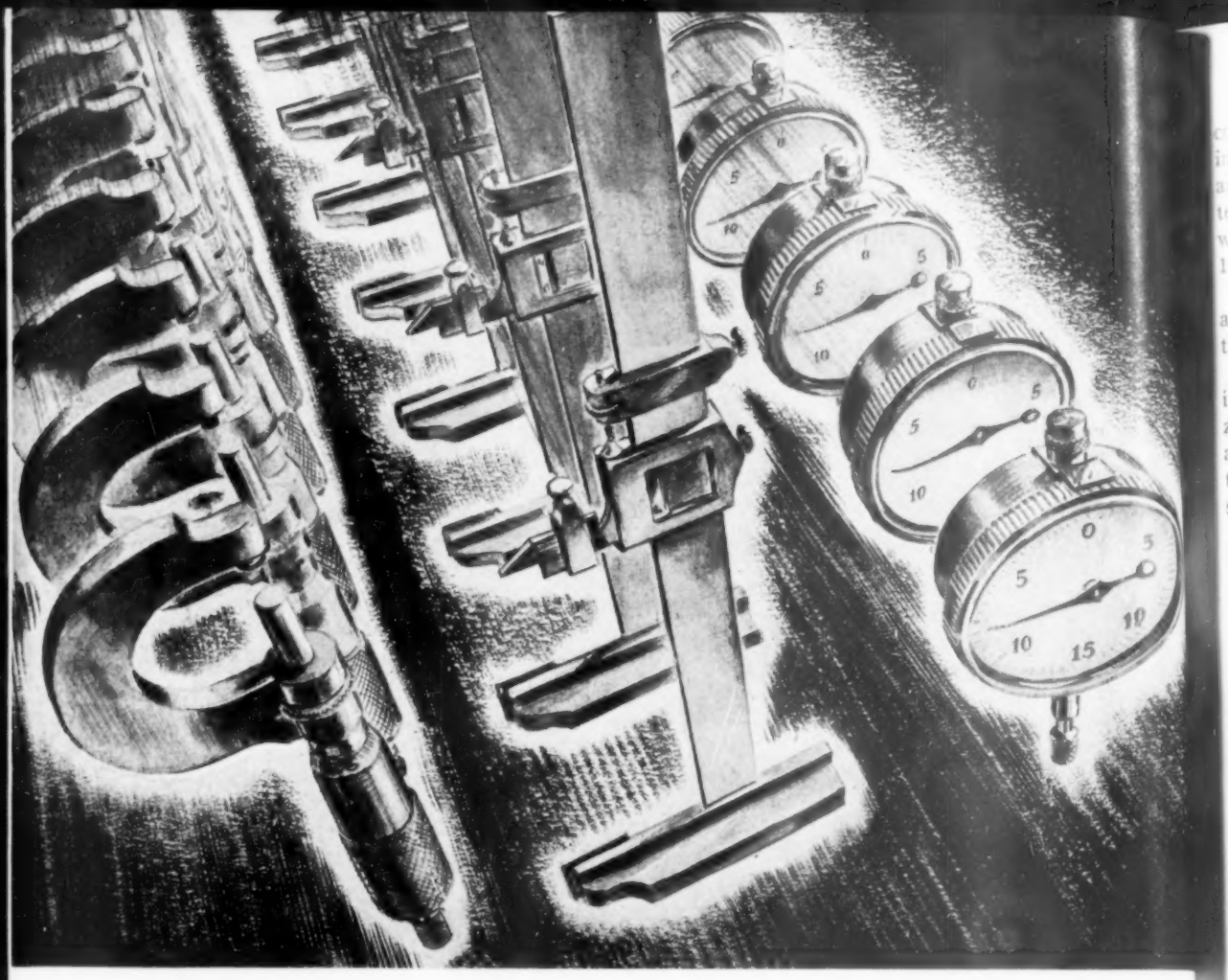
The first thought of the practiced and experienced hardener is that the tool will crack. Increased cooling rates do invite failure through hardening cracks, but if the tool is introduced to the cooling medium from a sufficiently low temperature, the danger is minimized. If the tool is fairly large, the cooling rate can be slowed.

Tools that are quenched and allowed to remain at room temperature from three minutes to thirty hours develop a condition wherein the austenite or as-quenched condition stabilizes itself. It is then difficult to transform it by refrigeration.

To realize full value from this new process, cool the tool directly from the quench in a continuous cycle, right down to 110° below zero. It would not hurt to cool the tool lower, but the advantages are not great enough to warrant additional cooling equipment. An average of 120° below zero will develop the greatest degree of sub-zero martensitic decomposition, or as-quenched structure breakdown.

(Continued on page 101)

STARRETT TOOLS



All MADE TO STARRETT STANDARDS OF QUALITY AND ACCURACY, HOWEVER URGENT THE DEMAND

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ARMY E NAVY

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PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
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We heat thoroughly; we must also cool thoroughly. Time cycles for cooling are usually about six hours. After allowing the tool to return to room temperature, we temper or draw, as with conventional hardening, to 1000°, or possibly 1100°F.

Because double tempering is almost a requirement to developing good cutting tools, the cycle is repeated.

After the first drawing or tempering operation, cool to the same sub-zero temperature as from the quench, allow the tool to again return to room temperature, and follow that with the second tempering operation.

Quenching and drawing without refrigeration stabilizes austenite much as when steel is allowed to stand at room temperature. Therefore, best results cannot be expected from conventionally hardening and drawing a high-speed cutting tool and then putting it in the sub-zero transformation treatment. Refrigeration should precede both draws.

LIFE INCREASED 300%

What are the results with this type of treatment? How good is it? Does it improve cutting qualities? How is the toughness? What about the percentage of loss in cracking?

Because the percentage of loss depends somewhat on the operation performed and the design of the tool, it certainly can be held to a minimum. A surprisingly small quantity of tools will crack out of those properly heat-treated by the sub-zero transformation method.

Concerning qualities, the following are accurate service reports:

SAE-2330 forgings, heat-treated in the neighborhood of 300 Brinell, proved troublesome to machine.

Stock bits which had been used on this job, not only straight 18-4-1, but the low and high cobalt bits as well, produced an average of about 25 to 30 pieces per grind. Carbide tips produced about 50 to 60 pieces per grind.

Finally the shop in question bought around 10 pounds of 18-4-1 annealed bar stock, $\frac{5}{8}$" square, which it cut into convenient lengths. After milling the "decar" off, it was heat treated by the sub-zero transformation method. Conventional treatment was employed—that is it was cooled to 100° to 120° below zero; allowed to return to room temperature, tempered at 1050°, then cooled again to 120° and then re-tempered.

With this type of treatment on conventional 18-4-1 high-speed steel, as many as 80 and, in some cases, 110 pieces per grind were found to be average. Because all jobs haven't proved quite as successful, it cannot be claimed that this treatment will double or triple the cutting efficiency of all high-speed tools.

However cutting efficiency is materially improved. Shop practice and the type of equipment used oftentimes have decided bearing on production results.

Some firms have even used sub-zero transformation on stock cutters, where the heat treatment record has been lost or was never known. By introducing a cooling cycle and another tempering operation on these tools, cutting qualities have been improved. Even on stock cutters where retained austenite is very stable, the cutting qualities have been improved 30 to 40 per cent. However, if stock tools have already received a double tempering operation, refrigeration results in a much smaller increase in cutting efficiency.

MICRO-STRUCTURE

The difficulty in explaining just exactly what happens in sub-zero transformation lies in the fact that the micro-structure seems to remain constant. However, investigators have decided that the martensitic product of austenitic decomposition, following complete drawing, is in such a finely divided state that average use and the average microscope will not show it up. But the fact that other physical properties do change, indicates a definite step in the same direction as conventional tempering.

Important factors in successful tool treatment are to keep the cooling continuous, whatever the hardening methods, right down to at least 110° below zero. Allow the tool to even out. About six hours are required for thorough cooling. Do not open the refrigerator door every few minutes and insert another tool, or this temperature will not be reached in any reasonable length of time.

HIGH-CARBON HIGH-CHROME

Steels, other than high-speed steels, to which sub-zero treatment is applied are usually those fairly high in alloy. Good examples are high-carbon high-chrome, particularly in the air-hardening variety—both the 12 to 14 per cent chrome, 1½ carbon, 1 molybdenum; and the 5 per cent chrome, 1 molybdenum, 1 carbon modified high-carbon chrome. Both of these steels tend, on cooling from the hardening heat, to retain considerable austenite. Probably the 5 chrome, 1 carbon, 1 molybdenum is the worst offender. But the condition is sometimes the fault of the hardening process used.

If a part has been pack-hardened and a little carbon has been added, the amount of retained austenite is greater. Then, hardness examination shows the as-quenched structure to be rather low in Rockwell "C" hardness. Such steels have a critical cooling rate, however, that also affects the as-quenched hardness. That critical cooling rate oftentimes has to be overcome by accelerating to quench as compared to air cooling.

Frequently, however, this low hardness cannot be predicted, and it may be determined only by examining the Rockwell hardness after cooling. If, then, the Rockwell hardness is low a refrigerating cycle can be introduced successfully, even though the steel remains at room temperature for quite a period of time. The same is not true with high-speed, for it must be cooled directly from the hardening temperature to the sub-zero temperature or transformation will not occur.

However, with high-carbon high-chrome, transformation occurs at about 80° below zero, and if the tool has been allowed to remain at room temperature for a period of time, hysteresis will not have reduced the critical cooling point to probably much lower than 100° below zero.

Often 5 chrome, 1 carbon, 1 molybdenum may come from an air-cooled quench at 58 or 59 Rockwell, after either pack-hardening treatment, atmosphere control, or salt bath, since the time at heat influences the retained austenite. On the 1½ carbon 12 to 14 chrome, a secondary hardness can be reached at about 925° to 950° F.

However, in tempering at that heat, hardness of the already formed martensite may be lowered to the point where the new structure, with the austenite that was retained and broken down, will not sufficiently build up the hardness lost in the initial draw. Therefore, it will be beneficial to develop a uniformly heat-treated structure directly from the quench, if possible.

(Continued on next page)

This is done by refrigerating the tool, if it is low in as-quenched hardness, to a point lower than 90° below zero. It is kept there about six hours, although neither the time the tool is thoroughly cooled nor the cooling rate is critical. The tool is then allowed to return to room temperature normally. Generally this type of steel will be five to six points harder Rockwell "C".

A hazard is involved in Rockwell inspection of as-cooled and returned to room temperature high-carbon high-chrome steels. Inspection should not be made immediately after the first cycle of refrigeration, since the steel tends to crack through the Rockwell indentation.

However, if cooling has been followed by a draw temperature of about 300° to sufficiently temper the martensite formed, little danger will be encountered. In fact, provided the tool has had a draw of at least 300° to 325°, any type of normal hardness testing can be introduced.

NICKEL CARBURIZING STEELS

Nickel carburizing steels respond unusually well to sub-zero transformation. In carburizing steels such as 23-15, 25-12 and any of the other nickel combinations, many engineers find that, whether they quench from the carburizing heat, or drop the heat in the carburizing furnace and then quench, or air-cool and then reheat and quench, the case hardness is much lower than preferred. Core hardness will be up, but case hardness is low.

The first step, then, in conventional heat-treating is to drop the hardening temperature to the point where there will not be a condition of retained austenite. However, at the same time core hardness will begin to lessen. It is preferable, then, to harden the steel at a temperature that will give the desired core hardness, allowing the case to come as it will.

That is exactly what sub-zero critical transformation process permits. After the tool has been quenched—usually in oil—and tested, the case may turn out to be as low as 58. Some turn out as low as 52 Rockwell "C" scale. That part, if then refrigerated to 120° below zero, will bounce or develop as much hardness as 12 to 15 points Rockwell "C" in the case, and the core will not be affected. The core is usually low enough in carbon so that there will be little retained austenite to take into account.

However, the case with the high carbon obtained in carburizing develops plenty of retained austenite. But because the hysteresis that is developed is overcome by cooling to approximately 90° to 120° below zero, the tool can remain at room temperature.

If operation is at a temperature of about 60° below, cooling must be continuous, since it is more difficult to break up the austenite formed at 60° below zero with this type of steel than it would be with lower temperatures. Lower temperatures are merely a safety factor, because the critical transformation point is just about 60° below zero.

TUNGSTEN SHOCK STEELS

The same procedure holds true with tungsten shock steels as with nickel carburizing steels. Those steels are used today in applications where the core requires a good, tough condition, usually around 50 to 55 Rockwell, but higher surface hardnesses are required to resist wear.

1000% IMPROVEMENT

•Though little success might be expected from sub-zero treatment of the straight carbon steels, one application concerned their use in a cupping punch for drawing steel cartridge cases.

High speed steel and high-carbon high-chrome punches split after runs of about 3,000 cases. When straight carbon was treated with a cooling cycle of 24 hours at 70° to 80° below zero, startling results were obtained.

Production per punch leaped from 3,000 to more than 30,000 cases, a 1000 per cent improvement.

The heat-treating procedure includes pack-hardening or carburizing these tungsten shock steels to the point where the case hardness will meet a specification of probably 62 or 63 Rockwell "C". This is, of course, a much greater hardness than originally expected of the steel.

This case hardness can be developed by any of the conventional carburizing mediums, provided the quench has been just exactly right and retained austenite is not developed. Should the tool quench out in the neighborhood of 58 to 60 Rockwell "C", the next step, of course, is to refrigerate, and if this type of steel is taken down to 110° below zero, or lower, the same increase in hardness characteristic is found as in the carburized nickel steels.

PUMP PLUNGERS TREATED

SAE-52-100 is a common steel which has served well in many applications. It can, however, develop a condition of retained austenite on quenching, as well as other alloyed steels.

In one particular case it was used on pump plungers which went into service in varied climates. After about two months of service, the plungers began to stick.

Investigation proved that there was evidently a more completely drawn structure after the plunger had been in service. The reason for it was probably this change in climatic temperature that developed ageing, or a continuous breakdown of the austenite that was retained on the quench, into martensite. Since martensite requires a little more space, the plunger grew.

The plungers had been tempered for a long period of time; in fact, they had been double tempered, and still there was not complete dissociation of austenite.

A refrigeration cycle was included in the heat treatment of this part, and a thoroughly martensitic structure was developed that did not grow or expand after that plunger had been in service.

In addition, grinding difficulties were far less after the 52-100 had been refrigerated. A tempering operation was included after the refrigeration cycle, to temper martensite forms, since some tempered martensite is somewhat unstable and brittle. The development was what is ordinarily termed a swell heat-treated structure.

GRINDING IMPROVED

It is common knowledge that, if a tool is not sufficiently drawn, it will develop grinding checks more quickly

(Concluded on page 104)

When You Do So—You Get This Extra Advantage at No Extra Cost

Only INGERSOLL has had 4 YEARS EXPERIENCE

in producing this Lower Cost Type of High Speed Steel for Hack Saw Blades

Specify *Ingersoll* D-B-L, on its 4-year record of past performance.

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(Tungsten . . . . . 5.00-6.00)
(Molybdenum . . 4.00-5.00)

The remarkable performance of Ingersoll D-B-L . . . its relative freedom from decarburization . . . its tough cutting quality and its high impact resistance . . . plus its lower cost, have made it a wartime favorite.

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Alloy Steels
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TEM-CROSS Steel
IngAclad (Stainless-Clad Steel)
Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels

than one which is thoroughly drawn.

Since the sub-zero transformation is really a part of a tempering operation, a more completely drawn structure which tends to grind better is developed.

The same holds true with high-speed steel or the high-carbon chrome, and practically any of the carburized nickel steels, since any steel that has retained austenite seems to crack quicker in grinding.

POSSIBILITIES FOR DRY ICE

Sub-zero transformation is rapidly coming to the front. It is quite easy to use, once the equipment is established, and the average user can do a reasonably good job with dry ice.

Dry ice, however, will hardly develop a temperature of lower than 90° below zero. Although the temperature of dry ice is about-110° to-111°, the temperature is generally around-90° in a container or an alcohol bath. That is low enough, however, for the carburized nickel steels and the high-carbon high-chrome. It will do a pretty good job on tungsten shock steel, but will not be sufficiently low for high-speed steel treatment.

It seems certain that in the future every hardening room will have some means of refrigeration for the parts being heat-treated, at least those that have ground fits.

TREATING GAGES

It has been the standard practice for years for gage makers to age their gages. The reason they age them is so that they won't change in size after they leave the manufacturer.

In heat-treating machine tool parts that will have a ground fit application, why isn't it just as important to insure these tools against growing or size change?

HIGH CARBON STEELS

It does not seem that satisfactory results can be expected from sub-zero treatment of straight high carbon steels. Nevertheless, one application concerned their use in a cupping punch for drawing steel cartridge cases. The cupping punch is used in the first operation of drawing out a steel cartridge case, and it is a tough one, because at that point the stock is still in its original thickness.

Practically all of the alloyed steels were used in an effort to develop a high compressive strength that would resist cracking in service.

However, even high-speed steel and high-carbon high-chrome split after a run of around 3,000 cases.

When straight carbon was considered, it did not seem as though there was sufficient retained austenite in straight carbon steel to cause a weak punch. However, it was treated with a cooling cycle, after hardening and tempering, of twenty-four hours, at approximately 70° to 80° below zero. Production on punches leaped up from 3,000 to over 30,000 shell cases per punch.

A few years from now we may use sub-zero transformation much differently than today. But, we are on a first stepping stone. Even at this early stage of the game we have been successful in improving tool life. The application of low temperatures will be an important factor in reaching the goal of better service characteristics from many materials.

THE END.

Indicators Increase Lathe Accuracy

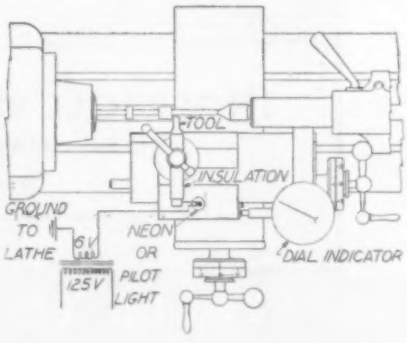
Pilot-Light on Lathe Aids .00005" Accuracy

● ERROR IN PRECISION lathe work requiring .00005" accuracy has been minimized by a pilot-light indicator developed at General Electric's Schenectady Works. The method eliminates the human element inherent in using a magnifying glass to check tool contact with the work surface.

Electrical contact between tool and work closes a light circuit, telling the operator exactly when to set the dial indicator at zero. The tool is brought up to the surface to be cut in the regular manner until just about to make contact. From this point, it is advanced slowly until the pilot light flickers. Little further movement is required until the light is steady, when the indicator is set at zero. A cut of any desired thickness can then be made with accuracy dependent only on the indicator and its reading. If that is set and read correctly, there can be no error.

Either an incandescent or neon indicating lamp can be used for the pilot-light. A small tranformer reduces standard 110-volt circuit to six volts for the detecting circuit. One line from the transformer is connected to the bed of the lathe, and the other line to the light socket. The center contact of the light socket is connected to a metal strip which makes contact with the lathe tool, being set against the tool when it is locked in the tool post. The tool is insulated from the tool post with a piece of varnished cambric or light cardboard.

This pilot-light indicating method can also be used where the work is stationary, such as on milling machines, by insulating the work from the machine and connecting the center contact of the light socket to the work.



An Absolute Stop for Close Limits

● A REFINEMENT in the stop on a hand turret lathe, suggested by a foreman at General Electric's Fort Wayne Works, has resulted in savings per machine which are expected to amount annually to 225 man hours, 225 machine hours, and 1000 pounds of otherwise scrapped material.

Previously, because operators' "touch" varied, the regular machine stop was set by trial and error to suit each operator. A dial indicator was added to the lathe carriage, so that the operator could run the carriage to the correct setting, adjust the stop, and set the dial indicator to zero. The method provides an absolute stop to close limits for all operators, regardless of difference in touch. THE END.

Standard Carboloy Tool Prices Now Generally Comparable to All Types of Cutting Tool Materials

THE STEADY INCREASE in acceptance of of Standard Carboloy Tools has made possible constant improvement in our quantity manufacturing technique to the point where highly efficient single-purpose equipment has been developed for practically all operations, effecting substantial economies in our mass production methods.

This has made possible a further price reduction—effective December 6, 1943—in the price of single point Standard Carboloy Tools to a level where they are now generally comparable, in price, with tools made of *ALL* types of cutting materials. These new, low prices now justify—more than ever before—your review of all single point tool turning, boring and facing applications not at present receiving the benefits of carbide use—in terms of increased production, faster machining speeds, better finish, longer tool life and lower cost per piece produced.

Send for revised price list covering 10 Standard Styles, 5 Standard Grades, for cutting steel, cast iron, non-ferrous metals, etc.

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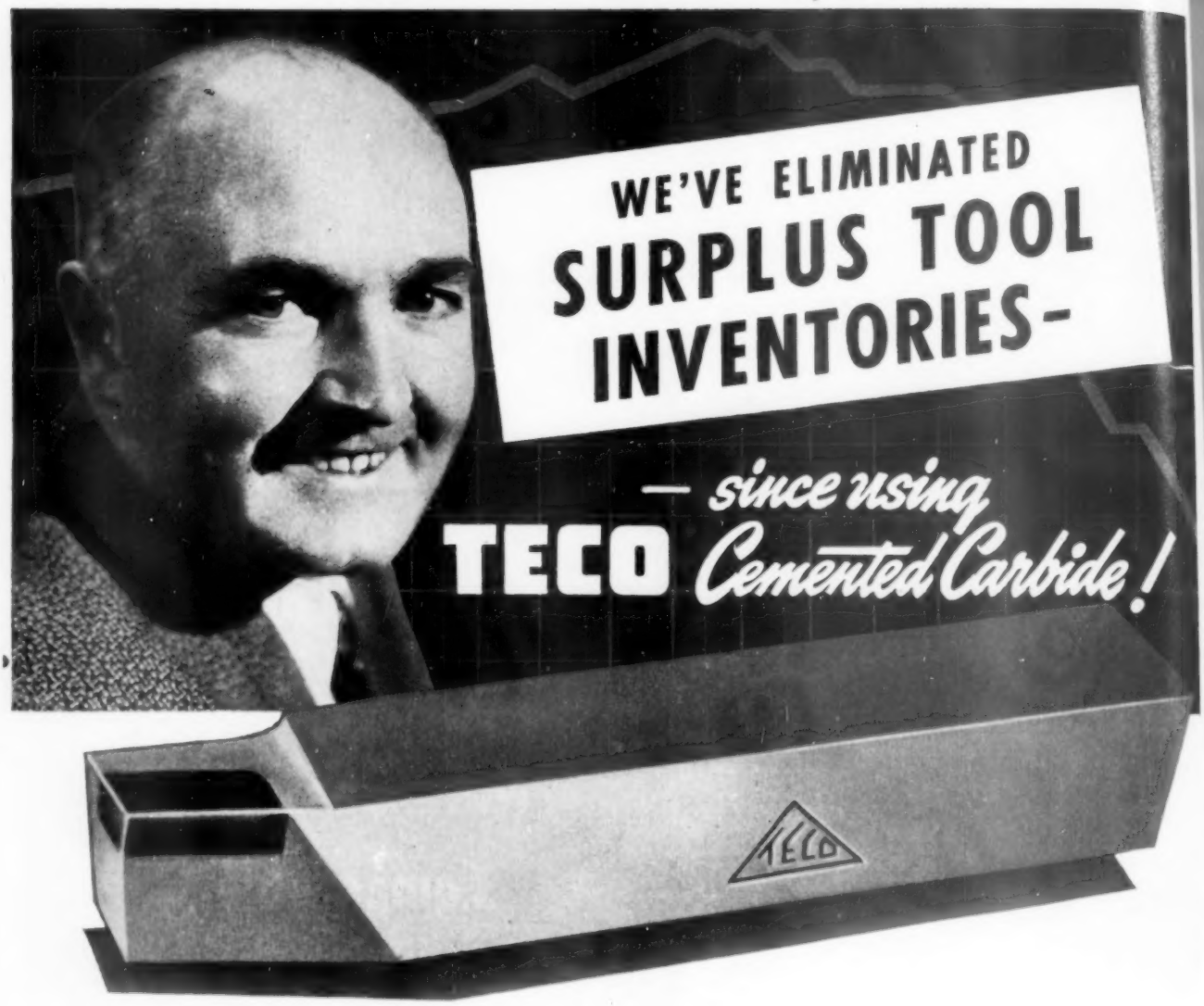
TRADEMARK

For Cutting CAST IRON and Non-Ferrous Metals

For Cutting STEEL

TUNGSTEN CARBIDES *** TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES



WHEN you use TECO Cemented Carbide tools, you'll find it unnecessary to maintain excessive reserve stocks of cutting tools. You actually get *more* production with *fewer* tools, because TECO Cemented Carbide stays on the job longer—produces more pieces than any other cutting material.

Extremely hard, dense and uniform in structure, TECO Cemented Carbide has unusual resistance to wear and breakage in high speed turning, boring and facing operations.

Our manufacturing facilities assure prompt and dependable shipment to meet your production requirements. Grades, styles and sizes for practically every machining need.

Write today for catalog giving full specifications.

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Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CEMENTED CARBIDE**

MEN • MATERIALS • MACHINES

Photographed for The Bramson Publishing Company

POST-WAR VIEWS:

PAUL G. HOFFMAN
PRESIDENT
THE STUDEBAKER CORPORATION
CHAIRMAN
THE COMMITTEE FOR ECONOMIC DEVELOPMENT

Machines Will Make More Jobs

How can American industry employ 9 to 12 million more workers in the post-war era than it employed in our best pre-war year? Here is a startling answer from one of the nation's outstanding exponents of the use of labor-saving machines and methods

WINNING THE WAR still has a triple-A priority. But time must also be found now to consider problems for which answers must be ready when hostilities cease.

We have paid a terrific price in blood and tears because we were unprepared for war. We may pay an equally devastating price if we are similarly unprepared for peace. For, regardless of all the wishful thinking we may indulge in, from the standpoint of the impact on our business economy, termination of the war in Europe will bring us face to face with 80 percent of the problems total peace will bring.

I am one of those who believes that anything short of Japan's unconditionable surrender is unthinkable. Any paralysis to our economy in the partial peace to follow the collapse of Germany may have a disastrous effect on our people's willingness to work and fight until Japan also is brought to book.

With total peace will come the urgent need for attainment of new high levels of employment and productivity that would have seemed fantastic three years ago. The problem is not merely one of reconversion of facilities from wartime to peacetime manufacturing. That could be accomplished quite readily and with little loss of time.

PAUL G. HOFFMAN, POST-WAR PLANNER

Paul G. Hoffman is no starry-eyed economist-prognosticator, no dreamer of what should be good for business and industry. As head of one of America's most progressive mass-production concerns, The Studebaker Corporation, 52-year-old Hoffman rose from a porter in an early Chicago auto agency to the presidency of this great independent auto producer.

●

Hoffman's knowledge of the post-war problems facing American business and industry stems from his work as Chairman of the Committee for Economic Development. Headquartered in Washington but not connected with the government, the Committee is an organization of industrial leaders seeking to promote increased post-war production by private enterprise.

●

The Committee's greatest service may lie in its study of recent developments in materials, techniques and methods which may contribute to lowered production costs, greater peacetime markets.

The magnitude of the task arises out of the fact that we must achieve a major expansion above anything hitherto known in peacetime. And it is a peacetime year that must be our base because this war economy in which we now find ourselves has no more relationship to the normal than has an economy from some planet, if any there be.

Fundamentally, it is important that we define as closely as possible our post-war employment goal. The 46,000,000 people, approximately, who were reported as gainfully employed in 1940, our last peacetime year, was obviously a low total. The 61,000,000 reported for the present period is probably over-employment.

WHAT IS FULL EMPLOYMENT?

What we really should strive for is a new high level of employment, one high enough to approximate what an economist might call full employment.

There is little agreement as to what such a figure should be, but it is safe to say that we would have an eminently satisfactory situation if we had gainfully employed, somewhere between 55 and 58 million people in the immediate post-war period. That spells out as from 9 to 12 million more jobs than there were in 1940. Of this total of new jobs, after the needs of the new post-war Army are filled, it is evident that the overwhelming number must be provided by industry. But a goal of jobs alone is not enough. The production problem enters the picture here.

High level employment could be attained very easily if we disregarded entirely the reasons for its attainment —a high standard of living and the maintenance of our free society. It is only by producing more that we can have more to divide. This means that with the present status of technological development we must, in my opinion, maintain the forty-hour week if we are going to attain a higher standard of living.

Jobs can be created, if that were the only objective, by turning our backs on technological advancements, but at what a cost! Actually, if we want to build to a high level of employment, we must take advantage of every technological advancement as rapidly as possible.

The automobile industry which cut jobs per unit most sharply during the industrial expansion era of 1899 to 1939, according to a study made by the National Bureau of Economic Research, registered in the same period, the largest gains in numbers employed, and in output. In contrast, the lumber industry increased its employment per unit of production, but suffered a sharp reduction both in total employment and in total output.

Simply out of necessity to provide enough jobs, and the right kind of jobs, we must substantially increase our gross output of goods and services. Gross output—not income—in 1940 was $98 billion. To provide 55 to 58 million post-war jobs, that output will have to be increased 30 to 50 percent, or using the 1940 dollar, $29 to $49 billion.

This is not an overnight accomplishment, but there will not be too much time to bring it about, perhaps two years after the final victory being the limit of time allowable. The enormity of the undertaking is understandable when one realizes that a 3 to 5 per cent annual increase in productivity normally is satisfactory.

I would like to explode one idea that's prevalent, namely, that if productive work isn't available on the private front, a gigantic public works program is the answer. If you will take a look at the PWA and WPA figures of 1940 you will find that they total just about as many men as can possibly be employed at useful work by the government within one year after peace comes.

PROPOSED PLANS NOT ADEQUATE

We will need a public works program after the war. However, if a green light were given to all the projects blue-printed by the National Resources Planning Board it is estimated that less than 600,000 would be provided with jobs within one year. Similarly if all projects at the state and local level for which blueprints are made were given the go-ahead, the best that could be hoped for is that within one year, two and one-half million persons might find jobs in such work.

Reconversion of industry itself is no real problem for the great bulk of industry but reconversion is not enough if we are to avoid unemployment. The big post-war job is the expansion in output required to provide a satisfactory level of employment.

THE END.

What's Ahead?

No. 1 in a Series

Experts are working experimentally on a universal sign language for use during the period of reconstruction following the war. It has a vocabulary of about two thousand words and can be learned in about a month.

★

Reshingling of homes may be entirely eliminated after the war. With plentiful cheap aluminum as one of the benefits of the great disaster, we expect to have aluminum shingles, and the glass industry has already developed a lifetime glass shingle.

★

Radio waves are now being used to spread the layer of tin on tin cans and thinner than it was before the war.

★

The Diesel engine is close to its long-sought ideal of one pound per horse power. This may indicate that this thrifty engine, already scheduled to power our postwar trucks, may also be suitable for our pleasure cars.

★

Little by little new ideas combine to make flying more practical for tomorrow's civilians. One of these is a simple device for night landing which uses two lamps aimed toward the ground. The beams of these lamps are focused so that they come together to form a single spot of light on the ground when the plane is at exactly the right height for "setting down."

★

A new fuse for artillery shells is said to be so sensitive that it will explode the shell on hitting a raindrop.

★

The use of aluminum can reduce the weight of a freight car from forty-five thousand to fifteen thousand pounds with a corresponding increase in capacity.

★

Factories have been built with heating pipes permanently laid in the solid concrete floor. The method seems to be practical, economical and suitable for the heating of our homes.

★

In spite of the war, the Dutch have been able to produce a new hybrid plant, a cross between the carrot and the beet called the "wobbie".

To supply a Pacific coast shipyard with 152′ one-piece keels for Navy minesweepers, giant trailers are being used that haul 60 tons of Douglas fir logs of this length.

★

Experiments are being made with artificial teeth held in place by magnets.

★

It is expected that vast amounts of magnesium will be used after the war, and it is encouraging to know that our supply is large and beyond the reach of the enemy. Although there is only fourteen one-hundredths of one percent of magnesium in sea water, there are four and one-half million tons in a cubic mile.

★

Fifty thousand patents, formerly the legal property of our enemies, are now available to American industry.

★

The electron microscope will now measure particles as small as one-millionth of an inch.

★

The Civil Aeronautics Administration expects us to have half a million private and commercial airplanes by 1950.

★

A new synthetic textile filament, the finest yet produced by man or nature, is so small that it takes twenty thousand miles of it to weigh a pound.

Automobile tires are now being checked for invisible flaws by passing high-frequency sound waves through them.

★

Plastic bearings for machinery will require no lubricants for moderate speeds and loads, and in many cases water has been found to give sufficient lubrication for even high speeds and heavy loads.

★

"Facsimile", a method of printing a miniature newspaper by radio in individual homes, was tried experimentally before the war began. By this method the printing is done during the night and a newspaper, complete with illustrations and advertising, is ready at breakfast time.

★

There is a very good chance that we may have television in full color and three dimensions. It may also be possible to store up television broadcasts to be re-run later.

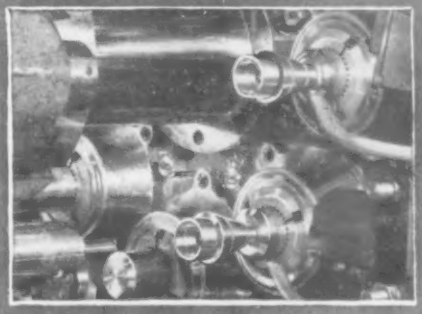
★

A micro-hardness tester is now made that can test a single microscopic grain of metal.

★

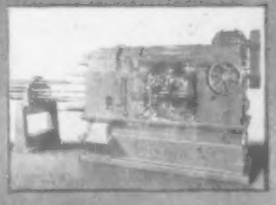
Shipwrecked sailors will soon have the benefit of a tiny searchlight no bigger than a walnut that is visible for 60 to 70 miles and good for 100 hours of use.

★



This big 8 spindle Conomatic completes seventeen operations required in the machining of an artillery shell fuse body *in 18 seconds.*

This is real production—the sort of production needed to win the war. Manufacturers will need this sort of production *after the war* if they are to meet competition, particularly if new ideas and better merchandise are to be put in the hands of all our people.



CONE

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CAPITAL COMMUNIQUE

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T. N. SANDIFER

Special dispatch from THE TOOL ENGINEER'S *Correspondent in the nation's capital.*

WASHINGTON

BEGINNING of the new year finds this city hearing more and more of reconversion for post-war production. Automotive manufacturers, who may lead the way in heavy industry production when the tape is lifted, have been here, giving Congress and agency heads their views.

Vice-Chairman Wilson, of the War Production Board, in fact complained recently that some industries are taking the attitude already that the war is over. WPB even is being confronted with demands from some industries that they either be permitted to proceed now with the necessary tooling job involved in post-war preparations, or be given opportunity to consider plans for such regearing of their plants for normal jobs once more.

The general position of WPB, as disclosed in recent statements by its various key officials, is along this line:

NO OK FOR POST-WAR TOOLS YET

The most important industries in the present war effort are the same ones which will be most important in post-war production. Therefore the WPB doesn't want to risk diversion of vital effort either for launching a program of post-war machine tooling, or even too much planning for after the war, at this stage.

In the opinion of Vice-Chairman Wilson, actual making of tools for post-war use very easily could interfere with present war production.

"We haven't got to the point where much can be done in line of actual manufacture of tools," he said recently in discussing the matter with a Senatorial committee. He therefore expressed opposition to the release of any war industry for post-war programs beyond the mere plan stage.

AUTOMEN WANT TO START NOW

This official view is directly opposed by such industrialists as Charles E. Wilson, president of General Motors Corporation, who later told the Truman Committee that inasmuch as it took the country eighteen months to convert its peacetime industry to war, it will take a commensurate period to re-convert.

In his opinion it is not too soon for the Government to permit manufacture of important machine tools that will be needed to get factories going on peacetime goods once more.

"I don't think we need to be afraid the people will think the war is over because a few steps are taken to prepare for reconversion," he said. He doesn't think the war is over, he said, but whether it is going to end in six months or six years, no harm could follow if plans for reconversion are launched.

Nevertheless, even Vice-Chairman Wilson, of WPB, said later that there may come a time in 1944 when his agency can say to some, probably aircraft plants, "You may begin to divert your production."

ADVANCE NOTICE ON TERMINATION

The situation points to such a possibility. WPB has reached a stage now where it can give advance notice to industries or segments of industries, of forthcoming termination of their contracts. More realism has been forced into estimates of production requirements now placed before industry. This, with the substantial cutbacks taking place, it is felt may speed the time when WPB can give industries advance word of reconversion possibilities for them.

Inventories of basic materials accumulated for war use are still up by some $5 billion compared with peacetime requirements, and such materials as copper, aluminum or even steel, are continuing to be accumulated at a high rate. However, such stocks are being watched carefully.

MACHINE TOOL SURPLUS SITUATION

In the case of machine tools, the situation is summed up here as one in which industry has gone through a period of extremely critical need, and now finds in some cases, that such equipment is in relatively free supply.

A great deal is being done toward inventorying machine tool surpluses and machines of various types. The Machine Tool branch of WPB is now reported to have a very good picture of available tools, and is making a great many transfers between using industries. The branch has a fair idea, though not necessarily a complete picture, of another situation mentioned here in the previous issue—tools ordered in good faith and now found surplus. At the same time it is recognized here that a number of plants are not by any means over-stocked.

BERNARD BARUCH MAY ACT

Another problem that is getting priority consideration, and has been mentioned here previously, is what to do with machines that are actually in the way, when a plant begins to clear its space for normal output again. It is now known that Bernard Baruch has become interested in the problem, and may be formally asked to prepare a warehouse program for the purpose. WPB officials have done a great deal of work, mostly exploring to see the size of the job. From the fact that Mr. Baruch has been asked to take it over, or may be, these officials have evidently been considerably impressed with the difficulties involved.

INSIDE ON WAREHOUSE PLAN

One interesting possibility is that all, or a number of the government-owned air-frame plants may be utilized as warehouses, both for surplus tools, and for separate categories of materials; semi-finished goods, and finished articles. According to this idea, the plants could be used for both systematic storage, and distribution of needed equipment and materials back to normal industrial channels.

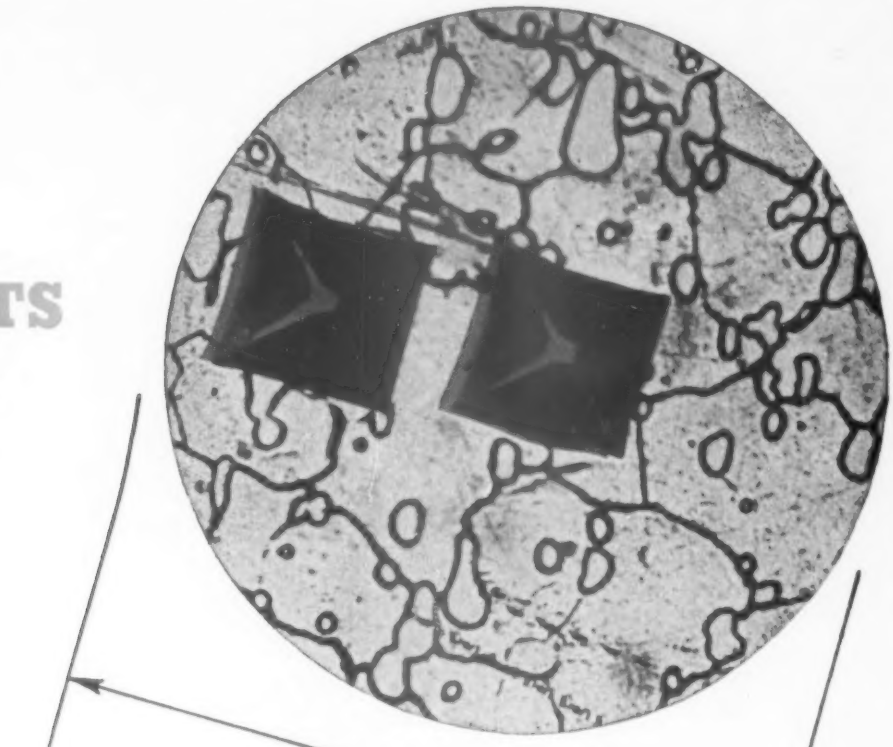
An automobile industrialist, K. T. Keller, Chrysler president, has given Washington what is probably the most graphic and complete picture of this

(Continued on page 112)

FROM THE WASHINGTON VIEWPOINT . . .

- Capital dopesters believe the automobile industry may lead the way in production when the tape is lifted. Production men from Detroit have been here giving Congress and war production agency heads their views on reconversion. WPB hesitates to give any go-ahead because war requirements are unpredictable.
- What will become of war-built machines that are in the way when plants begin to reconvert late this year? One plan under consideration is to use government-owned airframe plants as warehouses for surplus tools, materials and finished war products.
- Numerous industries are pleading for an opportunity to buy DPC machines in their plants that meet normal needs, then turn the remainder back to Uncle Sam. Argument is based on high cost of moving all of them into storage, estimated at $300 per machine. Some hint of easing a glutted post-war machine tool market is seen in revelation that 17,000 machines have been shipped to Russia since war started.

MICRO DOTS *now tell the* REAL STORY



.0025" of Michigan Gear Cutting TOOL STEEL

Checking the correctness of heat-treat of gear cutting tool steels by conventional methods alone has now been obsoleted by Michigan Tool Company. In the metallurgical laboratory at "Gear Production Headquarters" you will find such steels checked by new MICRO-hardness testers—under a 1000 power microscope.

This tester gives the individual hardness of every portion of the basic grain structure, where conventional methods can give only the average hardness of the grain particles covered. Ten of those dots, above, would not stretch across the diameter of the equivalent Rockwell "mark".

Once such a device was considered a scientific research instrument. Today, Michigan Tool Company employs it in routine production control to assure that the cutting tools it produces for the war effort will be the finest it is possible to make.

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

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A revised edition of our Tool Manual is just off the press. It has been brought up to date and a new section added, called "Tool Wear Analysis."

Unique ways and means for determining how overall performance may be improved following visual inspection of a dull tool are described and illustrated by charts. The analysis is based on the premise that the best tool performance and maximum life between regrinds is realized when conditions are such that the dulling of a carbide tip due to edge wear and dulling due to top surface wear are maintained in balance, and at a minimum.

This new section of the Manual suggests that a check be made: First, of the prevailing grinding methods to see if they are in harmony with recommended practice; second, of the cutting speed used, to ascertain if it is within the prescribed general range for the particular material being machined. A chart is provided to show the proper relation between speed and feed, and how adjustment may be made in this respect for best results as to wear resistance on a particular job within the limits of a single carbide grade. Finally, characteristics of the several KENNAMETAL grades are given with charts provided to facilitate analysis and to determine if a change in grade would be advisable to effect improvement.

You will, of course, want this valuable manual with its distinctive new feature; it will help assure the continued efficiency of your KENNAMETAL tools. A copy will be forwarded upon request.

—●—

The revolutionary method of analysing tool wear discussed in the KENNAMETAL Manual is also available in form of a wall chart especially designed for shop and tool room use. Write for yours today.

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KENNAMETAL *Inc.*
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LATROBE, PA.

SUPERIOR CEMENTED CARBIDES

(Continued from page 110)

problem, in describing its application in his own industrial plant.

He told an interested Senate committee that of 19,000 government-owned machines his company is operating on war production, 8,980 occupy Chrysler auto space, 1,857 are in a tank arsenal, and 8,438 are in another Chrysler plant.

To store 8,000 machines, he continued, would require 2¾ million square feet of floor space, and it would cost $3 million to gather them, put them on skids, and move them into storage.

Breaking down this round estimate, he said it will cost an average of $30 to pick up a machine, get all parts together, clean it, put it in shape for storage, skid it, move it, load it, or put it in another warehouse.

CUSTOMERS FOR MACHINE TOOLS

He related that many such machines have numerous auxiliary pieces, wrenches, fittings, and similar extras familiar to machine tool men, that have to be assembled in such an operation, so that a piece of heavy equipment can be billed as "complete" when sold. In this connection he recalled that after the last war it was a practice in some instances, where the extras were missing, to go out in the retail stores and buy up spares of the same general type, for inclusion in a given machinery item, so that it would have all its spares, at least on paper. This may convey a hint to any engineers buying machinery after the war of something to watch for.

The physical and financial aspects of this matter, have led to a widespread demand that the government solve the problem by selling the tools to the industries now using them. The argument is that a number of industries could thus get superior-type, new tools as compared with their ordinary equipment and the general level of the nation's industrial productivity correspondingly increased.

CHRYSLER WOULD LIKE TO BUY

Mr. Keller summed up this viewpoint when he advocated before a Senate committee that the government "decide now what it wants to keep for possible future use, and sell a lot of this equipment."

He said a quick survey of the tools his plant is using shows 3-4,000 government machines that might be of use, and that perhaps 75 percent would be economical to use somewhere in the plants.

"I think most of the standard tools could be put into use and the older material scrapped," he said.

He also raised a question that has been aired by machine tool men, the fact that surplus machine tools after the war would be a deadweight on the industry. Mr. Keller said the proposition was whether to make the change involving government tools in use, or buy something new.

The argument in favor of disposing of the tools to the using industries, as advanced by Mr. Keller, was that it would facilitate handling the whole situation. At present it would enable plants to pick out what they know they will need, buy it, and release perhaps, other stuff not having any future possibility, but valuable to some other industry. Later it would solve the prob-

(Concluded on page 136)

Check AIRCRAFT MECHANICAL PARTS FASTER CONFIDENTLY ACCURATELY *from Layout thru Final Inspection*

MASS production of interchangeable parts requires *faster more positive*, and *less personal* inspection. Gages such as these provide modern methods for controlling dimensions in *both* production and inspection. With a Dial Indicator Gage you *see*, quickly and positively whether the work dimension is correct. They require less trained skill to use than old fashioned type gages. For detail information write

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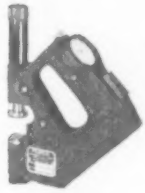
Left — THREAD GAGE. Checks pitch diameter faster, more positively than conventional gages. Adjustable for diameter.

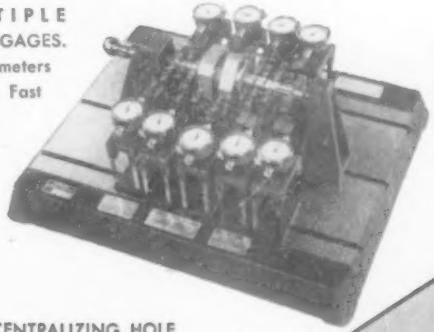


Left — SNAP GAGE. You can see with this gage faster than you can feel with a "fixed" gage.

Right—COMPARATOR. A sensitive instrument with fine adjustment for tool room or production use.

Above — CALIPER GAGE. A "handy" gage for various types of work such as patterns, cores, castings, plastics, bottles, etc. to specified dimensions.

Right — MULTIPLE INSPECTION GAGES. Checks nine diameters simultaneously. Fast and adjustable.



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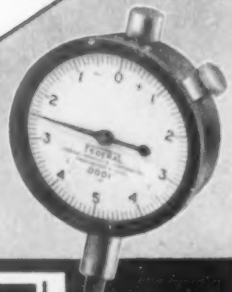
Left—CENTRALIZING HOLE GAGE. You can "explore" a hole for roundness, taper, shallow or high spots as well as diameter with this.



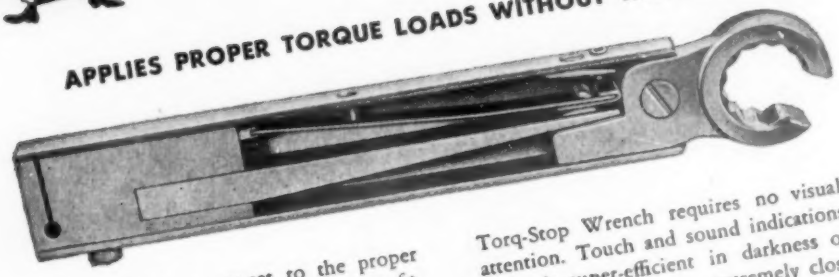
DIAL INDICATORS AND INDICATOR GAGES

★ ★ **FEDERAL** ★

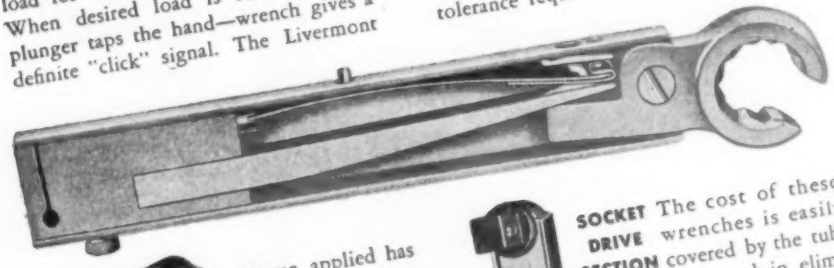
PRECISION MEASURING INSTRUMENTS

"TALKING" TORQUE WRENCH

APPLIES PROPER TORQUE LOADS WITHOUT WATCHING

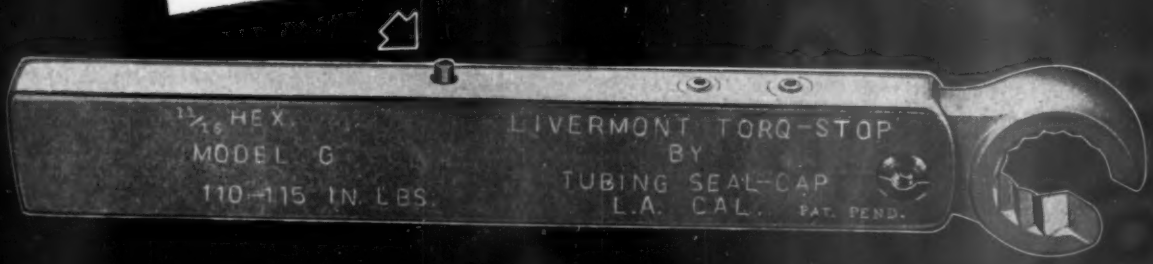


Each wrench is pre-set to the proper load for the nut it is designed to fit. When desired load is reached, small plunger taps the hand—wrench gives a definite "click" signal. The Livermont Torq-Stop Wrench requires no visual attention. Touch and sound indications make it super-efficient in darkness or in noisy areas — meets extremely close tolerance requirements.



HOSE CLAMP HEAD Torque applied has almost no variation regardless of where the handle is held. Load curve is steady and constant, dropping away slightly when "click" occurs. No jar or jerk to cause injury to the flare of the tubing, or operator's hand.

SOCKET DRIVE SECTION The cost of these wrenches is easily covered by the tubing saved in eliminating waste due to "under" or "over" torquing. Time is saved as the worker is relieved from making a decision as to when the required torque is reached.



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MACHINE TOOLS

. . . news and trends in the Machine Tool Industry . . .

INDUSTRY OUTLOOK

● Boom is over; backlog shrinks despite continued conversion

When September's total machine tool shipments dropped 3.2 per cent from the preceding month, it didn't look too bad. But, when the Tools Division of the War Production Board revealed its October figures, it was clear that the war boom in machine tools was over.

Shipments in October totaled approximately $76,000,000, a decline of about 11 per cent from the $85,842,000 value tag placed on September deliveries by the builders.

That orders have fallen off is no longer news, but that the total value of production in one month is down so much is interesting. The October figure continues a trend of decreasing shipments of machine tools since December, 1942, when new equipment delivered by U. S. builders reached the astronomical total of $131,960,000.

Since that date, the industry has been undergoing a metamorphosis. Month by month it has converted an increasing amount of its production facilities from machine tool building to the manufacture of direct war products and war products parts.

Despite this conversion, builders have been whittling away at the backlog of orders for machines. In October, they slashed a really sizeable figure off that backlog. It dropped about $47,000,000 to a total of approximately $285,000,000. At the end of September the order books showed unfilled contracts calling for $333,119,000 worth of tools.

As regards orders received in October, these also declined, dropping to slightly less than $30,000,000 after cancellations. Approved September orders totaled $31,759,000.

Cancellations during October, the WPB records show, amounted to $4,100,000 compared with $5,800,000 in the preceding month.

POST-WAR USE BY ARMY

● Services to hold best machine tools under new plan proposed

WASHINGTON—The Army would retain the best and newest machine tools now owned by DPC for tooling post-war arsenals as an insurance that it could go into mass production in event of any later crisis, under a scheme that was outlined at a recent meeting of the Machine Tool Industry Advisory Committee here.

If this suggestion were adopted, it is said, up to 25 per cent of machine tools now in use by the Army could be utilized in one of several ways: (1) To use the best and latest models in equipping post-war arsenals against a future emergency; (2) to furnish equipment to certain schools and colleges where their use would contribute to military preparedness and technical training; and (3) by establishing a reserve of specialized and other high grade equipment, to be laid up "in grease" against future needs at some time when appropriations might be tighter than at present.

Manufacturers have sounded a note of caution on proposed sales of war-discarded machinery abroad after the war. Recalling that Germany thus disposed of quantities of its worn-out or junked factory equipment to nearby countries and other markets in that period, and that the condition and performance of this stuff had lowered the prestige of German-made machine tools for years afterward in such markets, some makers in the United States are worried over a similar result if the United States disposes of worn-out surplus too freely.

As a safeguard, the Tool Engineer has learned, it has been proposed that before a surplus item is sold abroad after the war by the government, the original manufacturer be allowed to pass on its condition and worth. If the unit to be sold is not up to standard, within accepted limits, the manufacturer would be allowed to veto its sale to some foreign market where a poor product might damage the reputation of the maker for quality.

PRODUCTION INCREASE?

● Curtailed United Kingdom production may boost 1944 U. S. output

WASHINGTON—A possible increase in British machine tool requirements from the U. S. was indicated in discussions at meetings recently of the Machine Tool Committee of the Combined Production and Resources Board.

At the meeting here, which considered the present production situation of the industry in the United States, Canada and the United Kingdom, plans for combined planning of production were made.

It was indicated that the curtailment of machine tool production in the United Kingdom in 1944, in order to divert additional labor and facilities to other essential war production, may result in some additional requirements for machine tools from American builders. Members of the Committee stressed the fact that the eventual size of such requirements as yet cannot be forecast.

The committee, which was formed last October, is composed of one representative each from the United States, the United Kingdom and Canada. Ralph E. Flanders, president of Jones and Lamson Machine Company, is chairman. Sir Percy Mills, Machine Tools Controller for the United Kingdom, and Sydney D. Pierce, Washington representative of the Canadian Machine Tools Controller, are the other members. THE END

● For the interest of TOOL ENGINEER readers, who are buyers and users of machine tools, leaders of the machine tool industry have been invited to present their views on possible post-war trends of the industry.

OUR STRENGTH LIES IN PRODUCTION

OSCAR L. BARD
PRESIDENT
MICHIGAN TOOL COMPANY

THERE is one fact we cannot get away from—in War or Peace:

The strength of an Industrial Nation lies in its ability to "produce"—whether it be tanks or automobiles, guns or farm equipment, ships or refrigerators.

But, "production" itself is not enough. To be really strong, we must continuously produce "better" things. We could not have avoided defeat in 1942 with 1918-vintage automobiles, trucks, or refrigerators. It is customary to think of these things as "Consumer" goods. They really are not. The millions of them we own are one of the reserves we have been drawing on to fight this war.

Tomorrow, when peace comes, it will not be sufficient merely to replace what has worn out. We will need **better** products—to be as strong in peace as we are proving in war. That takes machines, new machines, better machines, and lots of them.

INDUSTRIAL NEWS DIGEST

. . . a review of significant developments and new techniques in mass production industries . . .

A.S.M.E. MEETING

● Attendance tops 4,500 at annual conclave; metal cutting stressed

NEW YORK—Presenting the most extensive program in its history, the American Society of Mechanical Engineers held its 64th annual meeting here November 29 to December 4.

Approximately 4,500 of the Society's 17,500 members attended the meeting at which 150 papers were presented at more than 50 technical sessions and symposiums. Three sessions on metal cutting research and four on general production engineering focused much attention on machine shop practice for war production.

New president of the Society is Robert M. Gates, president of the Air Preheater Company, New York.

Recipients of honors at the meeting included Charles F. Kettering, vice president, Director of Research, General Motors, who was awarded the Fritz Medal; Lewis K. Sillcox, first vice president, N. Y. Air Brake Company, who received the A.S.M.E. Medal; Igor I. Sikorsky, Vought-Sikorsky Aircraft, who won the Warner Medal; and Mitchell C. Kazen, Tool Engineer, Cook Engineering Company, winner of the Main Award.

The Alfred Nobel Prize went to Benjamin J. Lazan, Research and Testing Engineer, Sonntag Scientific Equipment Company.

PRODUCTION RECORD

● Chevrolet wins blue ribbon for November radial engine output

DETROIT—The motor car industry captured another blue ribbon in war production in November when an all-time high record for aircraft engine output in one month was established by General Motors' Chevrolet Motor Division.

M. E. Coyle, Chevrolet general manager and vice-president of the Corporation, said that the nation's number one auto builder had turned out the largest single month's production ever attained by any producer in the aircraft engine field.

The record was set in the production of 1,200-horsepower, 14-cylinder Pratt & Whitney engines, Coyle said. Chevrolet's first P&W engine was completed 20 months earlier. November's record involved the production of two different engine models with more than 300 non-duplicated parts, it was explained.

Seventeen plants in the Division's manufacturing system contribute to the Pratt & Whitney engine program, including four aluminum forge plants, a magnesium foundry, machining plants and an assembly plant, Coyle stated.

Every plant now utilized by Chevrolet in producing this record-breaking volume of aircraft engines, was producing automobiles or their component parts less than two years ago.

(Editor's Note: For first technical story on Chevrolet aircraft engine program, see The Tool Engineer, May 1943.)

POST-WAR INDUSTRY

● National Association of Manufacturers plan for peace

NEW YORK—Plans for post-war industrial expansion and reports from governmental leaders on the progress and outlook for war production were highlights of the second war congress of the National Association of Manufacturers, held here December 8-10.

Post-war goal of mass production industry, the 3,500 key executives gathered here agreed, is full-time employment and an expansion of the country's civilian productive facilities.

(Continued on page 118)

Scientists of Measurement

Louis Polk, president of The Sheffield Corporation (left), and C. H. Reynolds, vice president, watch as an original set of Johannson Gage Blocks are checked in the company's Dayton, Ohio, laboratories.

If it were possible to split a human hair into 2,000 equal parts, the visual gage pictured above could measure the diameter of those parts.

An average human hair is .004" thick, but this gage will measure dimensions of less than two millionths of an inch. So sensitive is the instrument that it will reveal how much a piece of metal expands when warmed only by the touch of a human hand.

This Sheffield instrument is being used in the company's laboratory to check gage blocks. In the foreground is one of the original sets of master blocks made by the late Carl Johansson, famous Swedish scientist, and presented to Sheffield years ago on one of his earliest visits to the United States. Because of its historical value, the set is highly treasured. The other original sets were given to Henry Ford and the King of Sweden.

"GREENIE" T.M. REG. U.S. PAT. OFF. — *Just Eliminate the 'Bugs'*

HOLY SMOKE, GREENIE! SOMEBODY MUST HAVE SABOTAGED TH' BLUEPRINTS!
CONTROL YOURSELF, BOSS— MAYBE WE'VE STUMBLED ON TO SOMETHING FOR THE POST-WAR MARKET!
RALPH DAVIS

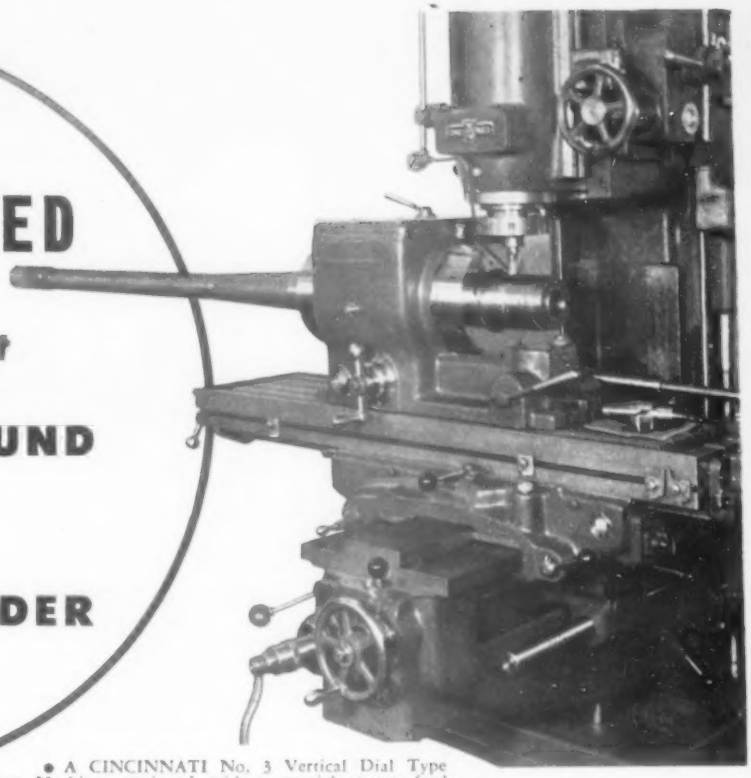
CORRECT CUTTER SPEED

Selected without

WALKING AROUND

OR

"DUCKING" UNDER



• A CINCINNATI No. 3 Vertical Dial Type Milling Machine, equipped with a special power feed rotary milling work head. The operation consists of milling a circular recess on the part. This job was tooled up by CINCINNATI Service Engineers, who will be glad to draw upon their experience in solving your unusual milling problems.

THIS type of job, like many others in the average shop, requires a change in spindle speed (cutter speed) to obtain any semblance of production, finish and cutter life. The part requires a milled relief around the main diameter at the large end. A 1-13/64" diameter end mill, running at 188 r.p.m., mills the principal portion of the relief. This leaves too large a radius at the end of the cut, so it is then removed with a .407" diameter cutter running at 550 r.p.m.

With CINCINNATI Quick Change Collets, the cutters are changed in a few seconds, and with the exclusive Dial Type feature of power speed and feed change from the front operating position, the speeds are changed as desired in a few clicks of the speed dial . . . without taking a step.

This one Dial Type feature alone is worthy of your most serious consideration when selecting new milling machine equipment. There are a host of other Dial Type features, too, some of which are tabulated in Sweet's Catalog File for Mechanical Industries. All of them, along with complete engineering data, will be found in catalog M-970-2, a copy of which may be had for the asking.

• CINCINNATI Vertical Dial Type Milling Machine. The Dial Types are made in plain, universal, and vertical styles, Nos. 2, 3, and 4 sizes, medium speed and high speed ranges. Complete engineering specifications may be obtained by writing for catalog M-970-2.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER SHARPENING MACHINES

●Too much praise cannot be given the American cutting tool industry for its production efforts since Pearl Harbor. Because many readers of The Tool Engineer magazine, who are buyers and users of cutting tools, are interested in the post-war outlook for this industry, some of its leaders have been invited to present here their views on the subject.

☆

WAR-BORN KNOWLEDGE WILL TELL

R. G. MICHELL
ECLIPSE COUNTERBORE

"The enormous surpluses of cutting tools . . . . should not be an insurmountable obstacle . . . . "

●Much of the future of the cutting tool industry in the post-war period depends upon what individual manufacturers in that industry have learned during the high production, high pressure war period.

Substitute materials for the long-used standard high speed steels have taught us that for certain types of operations the old-line cutting steels were not always the best.

•

Augmented high production has brought out weaknesses in some types of cutting tools which did not come to light in the former mass production programs.

Those producers, with an eye and ear always toward improving their products, have not failed to take advantage of this educational process. They have incorporated in their products lessons learned in the greatest of all laboratories—round-the-clock, hard-hitting war plants.

Just as World War One made apparent the great and distinct advantages of tungsten steels over the former carbon tool steels, World War Two has broadened materially the advantages of cemented carbide tipped tools over tungsten steels, for certain types of operations.

•

The enormous surpluses of cutting tools which may be on hand on "V" Day, should not be an insurmountable obstacle to alert cutting tool manufacturers who have developed definitely improved products, whose performances will surpass that of former products to the extent that the use of these surpluses of obsolete cutting tools will make them too costly to be practical, at any price.

INDUSTRIAL NEWS DIGEST

(Continued from page 116)

The challenge which industry has given itself was voiced by General Motors' Chairman, Alfred P. Sloan, Jr., who said, "Never again can we afford to take the risk to the stability of our institutions of a 50 per cent utilization of our economic resources, with millions of people out of employment and millions more working short time, regardless of what the underlying causes may be."

Plans for 1944 war production presage radical changes in the output of many plants and drastically increased production in many others, Charles E. Wilson, executive vice-chairman of the WPB, told the conclave.

The former General Electric executive told the manufacturers that production this year must jump 30 per cent over 1943 output, which would be 50 per cent more than 1942 output. Tank production, he said, would be at least 25 per cent less than that in 1942.

Wilson disclosed that the blueprints for 1944 call for:

An increase in aircraft tonnage of 185 per cent above 1943.

Maintenance of naval construction at the present rate, or 130 per cent above the average for 1943.

Merchant ships to be built at the present rate, or 30 per cent over last year's average.

A reduction of about 20 per cent in ordnance and signal equipment for ground forces.

Wilson, generally recognized as the spark plug of the WPB, emphasized that industry and its workers should not get the impression that the war is over, that the war production job is completed.

"We are coming into a period of complex readjustment," he said. "Facilities, materials and manpower will be released in one segment of the war production program when they are vitally needed in another segment.

"Unless this is thoroughly understood by the American public and particularly by those who produce war material, our task in 1944 is certain to be hampered."

HALL FOUNDATION

●Educational projects planned at Hall Foundation meeting

NEWARK, N. J.—Dedicated to the advancement of industrial educational methods and facilities, the Herbert D. Hall Foundation held its third annual meeting here, November 13.

The Foundation, which is seeking to stimulate technical and industrial shop training in secondary schools, determined at its meeting that there is a definite need for an institute or school which would have as its objective the training of technical men who would be neither engineers or machine operators, but supervisors or foremen.

Such courses should cover six years of study, four in high school and two at a Junior College level. The Foundation's top level of activity, it was decided, should be this Junior College or "Management and Production Institute". Plans visualized at the meeting call for assistance from the Foundation to school systems in industrial centers in setting up more adequate industrial training.

Nearly 5,000 copies of the Foundation's first publication, "The Machine Tool Primer," have been distributed to vocational schools, colleges, industries and the armed forces for training workers, it was revealed. The Chinese Industrial Cooperatives are making a micro-film of the "Primer" for use in China, it was reported.

Now in preparation, Foundation members said, is a second book on "Tool Design". Publication is expected this year.

GEAR ACTIVITIES

●Association reports increased activity, seven new members

PITTSBURGH—The gearing industry, as represented by the members of the American Gear Manufacturers Association, showed an increase of 15 per cent in the business booked in October, 1943, as compared with September.

These production figures do not include turbine or propulsion gearing, Newbold C. Goin, Executive Secretary of the Association has revealed. The October index figure, he said, stood at 368.

At the same time, Newbold reported that seven new members were elected to the Association at its fall meeting in Chicago.

New Company members are: The Auto Engine Works, St. Paul, Minnesota; Joshua Hendy Iron Works, Sunnyvale, California; Schafer Gear Works, South Bend, Indiana; and Swiss-American Gear Manufacturing Corporation, New York.

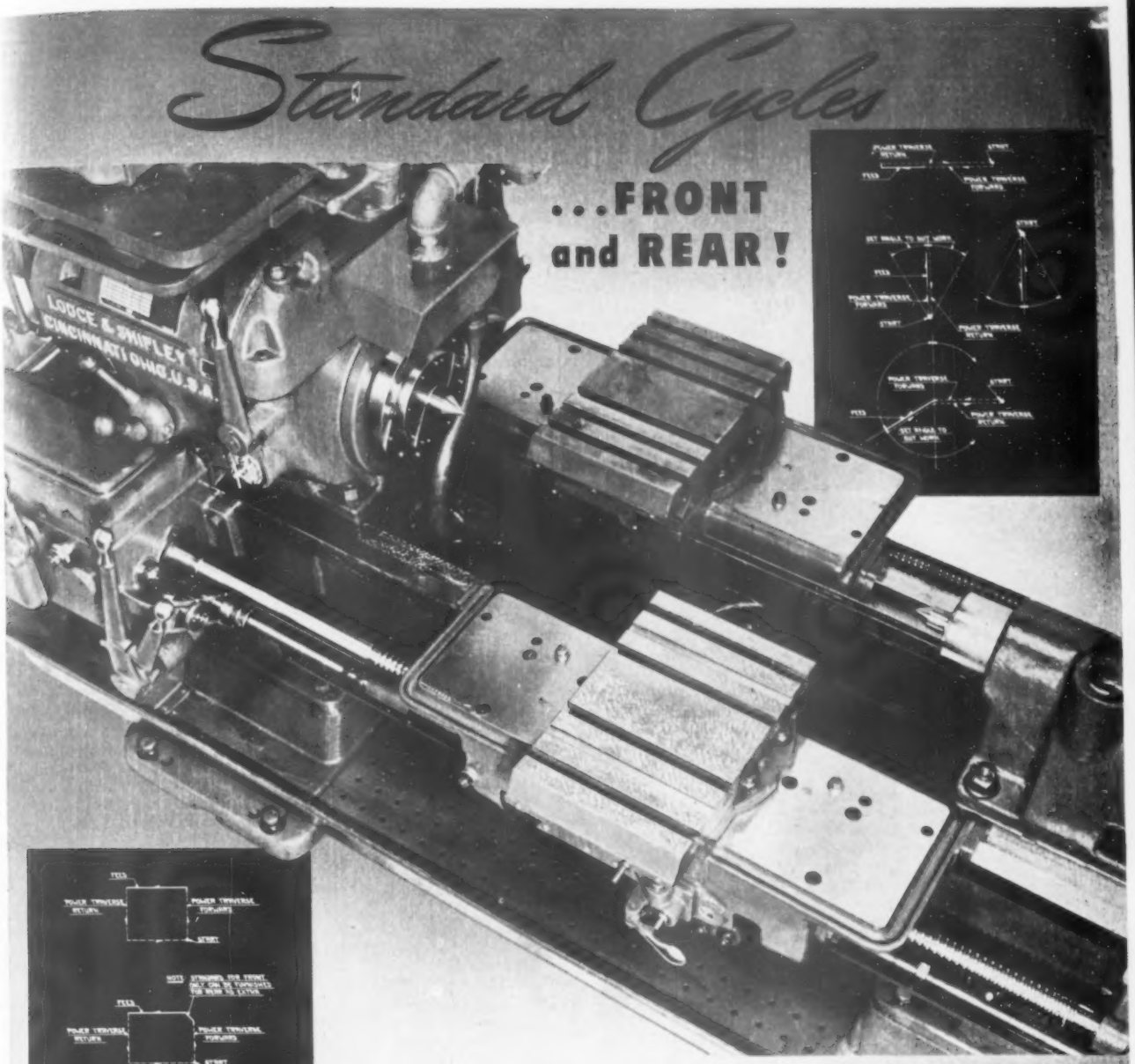
New Associate Company members are: Harnischfeger Corporation, Milwaukee; and Aircraft Accessories Corporation, Kansas City, Kansas.

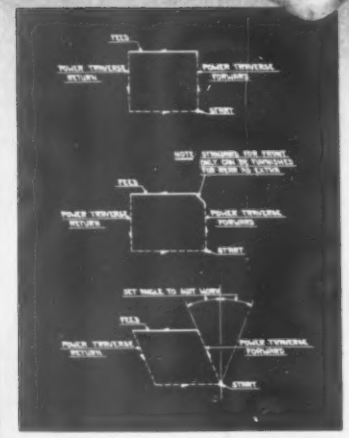
One Academic Member elected was Professor D. K. Wright, Jr., Case School of Applied Science, Cleveland, Ohio.

(Continued on page 120)

Standard Cycles

...FRONT and REAR!





Oct. 8, 1943
Feb. 23, 1943
Aug. 23, 1942
March 6, 1942

THE No. 3-A DUOMATIC LATHE is a full automatic lathe for the advantageous use of multiple tools in turning and straight and angular facing operations. It is particularly adapted to quantity production of lathe work in small or large lots whether between centers on an arbor or in suitable chucks or fixtures.

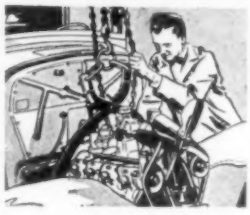
Write for Descriptive Booklet, No. 601-FL.

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES

MOTOR MEMOS

While war production continues to rise, anxious motor makers beg for Washington OK on reconversion plans. Henry Ford returns to driver's seat



DETROIT—Statistical reports usually make dry, uninteresting reading. But one report compiled in the Motor Capital last month is scintillating. The selection of facts used in this report on the automobile industry's war production is the reason.

Here are some of the facts: In the past two years $13 billion in war products have been produced . . . . The industry now is operating at a war production level of $10 billion annually . . . . In 1941 only 23 per cent of war materials being turned out were aircraft. Today, that figure stands at 41 per cent of a vastly increased total production . . . . Some 11 per cent of the current production program is devoted to tanks, 21 per cent to guns, ammunition and marine equipment.

More facts: Since Pearl Harbor the dollar volume of war goods has expanded several times . . . . Aircraft is 11 times its former rate and currently exceeds $4 billion annually . . . . Military vehicle production has been tripled, now tops $2.5 billion annually . . . . Eight tanks now leave auto-built assembly lines where one left before the Japs struck Waikiki.

The figures prove that the industry's self-designed title of "Arsenal of Democracy" is no misnomer.

● **Reconversion:** The motor makers are turning the heat on. They give Congress and WPB its choice, post-war prosperity or post-war depression.

Summed up, the automobile industry is convinced that if work on retooling is not commenced soon, if they are not allowed to make at least partial changes in tooling for automobile manufacture, months of unemployment face hundreds of thousands of regular workers not only in Detroit, but in affiliated plants and industries throughout the nation.

To many a production-wise man in the plants, the stubbornness displayed by WPB on the matter makes the future look black. Actually, it may not be as bad it seems.

Top management knows, and WPB has admitted, that the time for many a contract cancellation in the auto industry is not far off. But there is a lot of psychology mixed up in the matter.

With the devil-may-care attitude of many a worker, too many signs of reconversion at this stage of the game is all that might be needed to start the word among the rank-and-file that "the war is won". Result: Still lower output per man.

General Motors and Chrysler have made intelligent reports to the Truman Committee (see The Capital Communique, page 110). GM's Wilson says his organization can be making cars in three months, turning them out in quantity in six if reconversion can be started now, and contract termination will be handled quickly.

What the industry wants to know most is "how soon after contracts are cancelled can we move war production machinery out of our plants, move our own back in?"

● **Chips:** The tractor assembly line at Ford's Rouge plant is turning out 150 units daily. Ford-Ferguson will make 25,000 of 34,000 units approved . . . . Backlog of war orders for the auto industry now totals $15 billion . . . . Under way is a 100 per cent increase in production schedules for landing barges, amphibious trucks and seagoing tanks . . . . General Motors has a post-war "master plan" that calls for spending $500 million for reconversion, technological improvements and retooling.

● **Ford:** Back in the general manager's seat he relinquished years ago to his late, respected son, Edsel, the pioneer motor maker is driving his production organization hard.

Beset by strikes, even facing possible foreman-trouble, Henry Ford's great Rouge plant nonetheless is turning in a highly creditable war production performance. Out at Willow Run, production has left the "let's try it another way" stage. Big, completely assembled B24's are really rolling off two final assembly lines, and shipments of partially assembled units are being stepped up.

Dramatic, but little mentioned in recent press reports of Ford's plane building is the complete reversal of the basic plan for bomber production. First, the Army decided Willow Run would build partial B24 assemblies for shipment to other assembly plants. Then after construction was started, the projected size of the plant was doubled to permit final assembly. Before the factory was well under way, the overall size of the entire project was, roughly, doubled. With the exception of instruments, engines and similar components, the entire plane and all its parts were to be manufactured at Willow Run.

Many a Ford man knew, and said, that such a system was impractical, wasteful. Then the Army approved—some say forced—Ford plans to decentralize parts manufacture to other Ford plants and subcontractors.

Needless to say, the Union complained, screamed, and threatened when the plan was inaugurated. Workers were sent with parts jobs to other plants in the Detroit area. War or no war, that upset union plant organizations. Labor leaders' complaints were not Ford management problems, and the AAF was conveniently deaf.

Proof that decentralization has worked are rising Willow Run assembly figures, the recently approved statement that more than 1,000 bombers were flown away last year.

(Continued from page 118)

KNOW-HOW PAYS OFF

● Production methods developed by Bendix Aviation Division

TETERBORO, N. J.—Straight line production of more than 70 basic types of aircraft instruments and engine components at a current rate of more than 375,000 units per month has been achieved since Pearl Harbor by the Eclipse-Pioneer division of Bendix Aviation Corporation and its sub-contractors.

The division, Raymond P. Lansing, vice-president, revealed, now is a center for engineering, development and volume manufacture of the greatest variety and volume of precision aircraft equipment ever produced. Unit deliveries have exceeded 1941 levels by as much as 200 times, according to Kenneth MacGarth, general manager.

Eclipse-Pioneer, which has effected price reductions to the government totaling $18,000,000 since Pearl Harbor, MacGarth said, is one of the largest units of the Bendix Corporation, which operates 30 plants from coast to coast. Since war started, the division has doubled its operating floor space and the total number of employees in its own New Jersey plants.

As a result of concentration on the development of special production equipment, the general manager said, more than 40 per cent of production operations formerly done by hand by skilled workers now are automatic or semi-automatic and more than 30 per cent of the division's total employees are women.

To break bottlenecks in its production program, MacGarth said, the division's engineers and "machine-wise" workers since Pearl Harbor have: Designed or built 476 machines to simplify manufacturing processes; created approximately 30,000 special tools or modifications of tools; and provided approximately 20,000 tools and as many as 40 "model" machines to the division's 35 sub-contracting firms.

COMPONENTS SCHEDULING

● Aircraft Scheduling Unit reveals new procedures

DAYTON, OHIO—Procedures under which the Aircraft Scheduling Unit is empowered to schedule critical C.F.E. components under War Production Board General Scheduling Order M-360, have been announced by Colonel E. W. Rawlings, Administrator of the Aircraft Scheduling Unit, Wright Field.

Colonel Rawlings emphasized his belief that the cooperation existing between manufacturers and ASU will make it necessary to resort to scheduling only in such cases as revision in spares requirements and changed programs resulting from actual combat experience. Industry Advisory Committee cooperation and increasing "know-how" were cited as likely to avert the need for widespread scheduling.

Component scheduling will be undertaken only after it has been determined that utilization of surplus stocks, defla-

(Continued on page 122)

PRODUCTION THREAD-GRINDING *at Lower Cost*

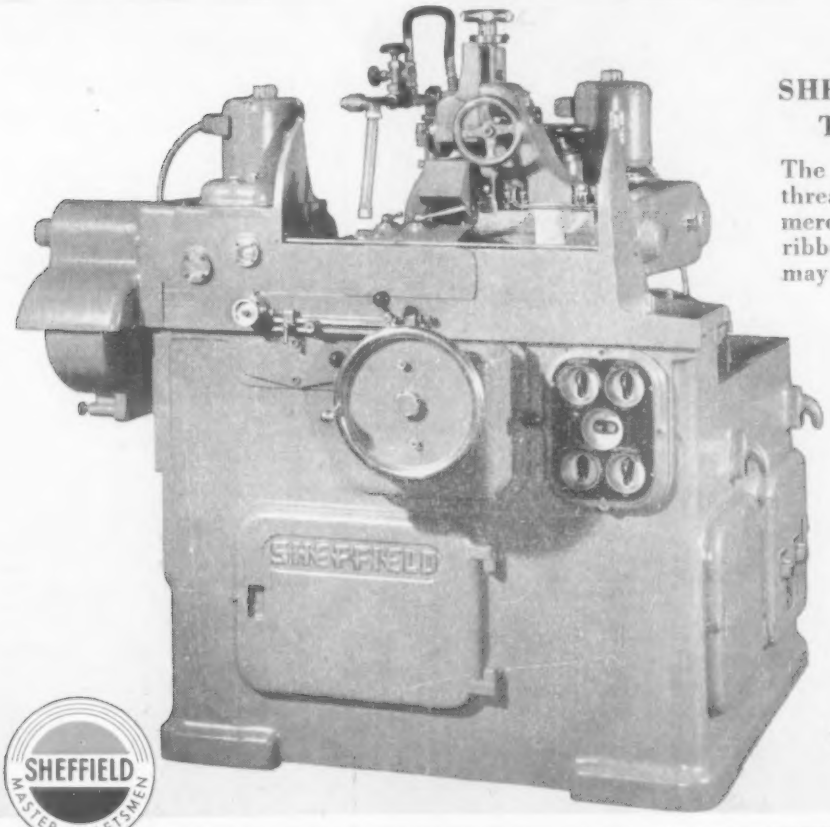
Aircraft Engine Parts
Instrument Parts
Ordnance Components
Machine Tool Parts
Precision Mechanisms
Threaded Production Parts
Gages

Finished thread completed quickly in one plunge cut with the multi-ribbed wheel—longer threaded sections produced by *traverse grinding.*

Grinding time reduced 50-75% on multiple threads ground in one pass—no precision indexing.

Machine capacity is sufficient for 90% of all grinding needs—can be used both for production and gage work.

Commercial production thread grinding more economical than ever. Threads produced by other methods may now be ground with Sheffield Precision Thread Grinders.



No. 100 SERIES SHEFFIELD PRECISION THREAD GRINDER

The first American designed thread grinder available commercially on which either multi-ribbed or single-ribbed wheel may be employed.

WRITE FOR FULL DETAILS
BULLETIN M-100-143

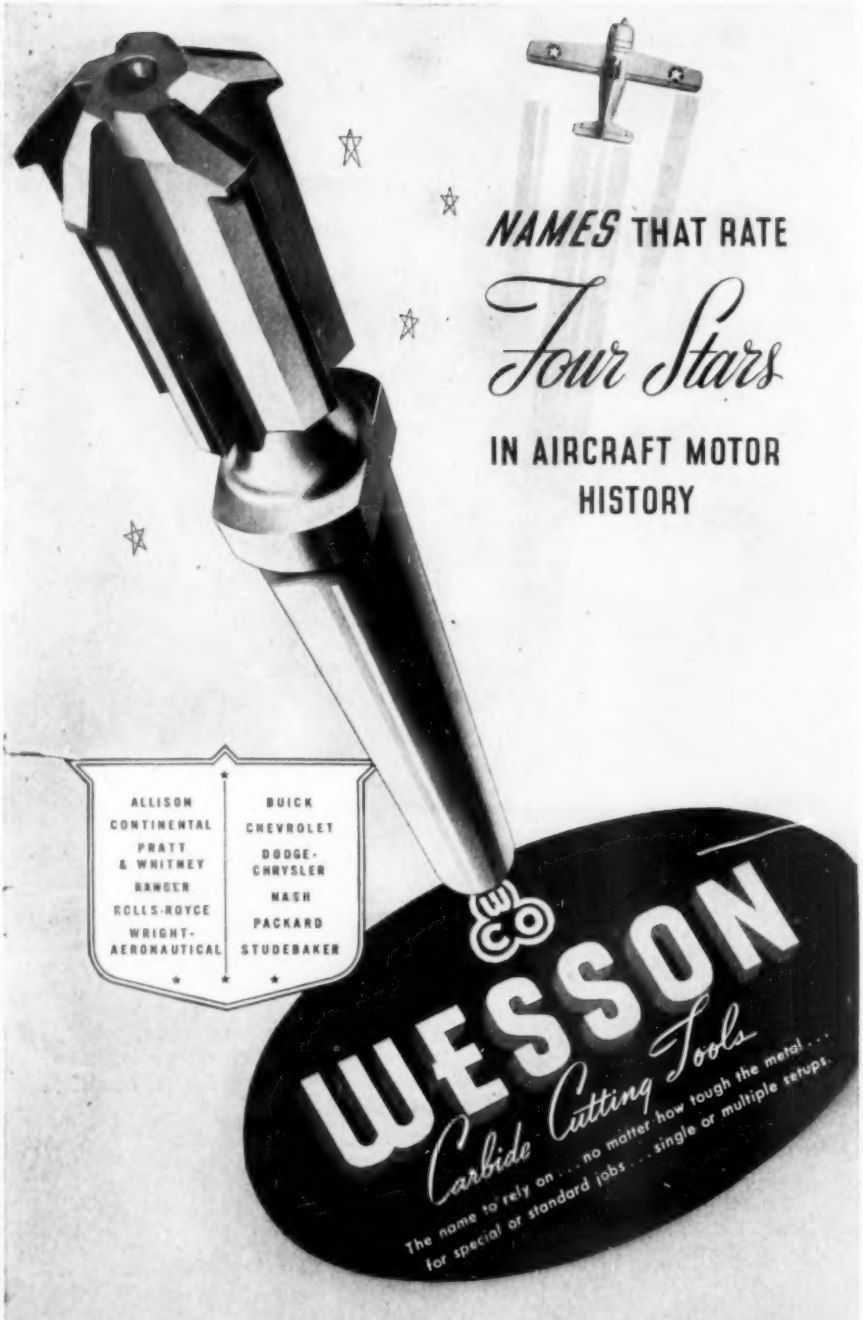
SHEFFIELD MASTER CRAFTSMEN

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS—GAGES—MEASURING INSTRUMENTS—CONTRACT SERVICES

ARMY E NAVY



In the Army and the Navy, it's "Four Stars" . . . the insignia of a General or an Admiral . . . and the same rating goes to these names that are making aircraft motor history. Knifing through skyways at unmatched speeds . . . spearing the heavens . . . American planes, powered by these big-name motors, are leaders on the way to Victory!

In tooling up for their production, such leaders have relied on **WESSON** . . . the name that rates "Four Stars" *for precision in Carbide Cutting Tools*, now symbolizing new standards of precision in the cutting tool industry.

WESSON engineers are ready to cooperate with you in tooling up for machining new modern, tougher metals . . . faster . . . to closer tolerances and finer finishes . . . for present war production and post-war planning.

WESSON COMPANY, DETROIT, MICH. (Ferndale Station)

Future Stars: Looking ahead, American industry sees countless stars of peacetime production . . . better homes, better equipped; better refrigerators, laundry and kitchen equipment, vacuum cleaners . . . better autos, trucks, tractors, farm and factory machinery . . . made possible, in part, by WESSON Carbide Cutting Tools . . . helping produce new products made from modern metals, tougher, more durable . . . produced faster, at less cost.

INDUSTRIAL NEWS DIGEST

(Continued from page 120)

tion of order boards, increased production through Industry Advisory Committee procedure and remedial action have failed to bring requirements in line with productive capacity.

When scheduling is inevitable, the ASU will give advance notice, it was stated.

MATERIALS

OUT OF BUSINESS

● Steel Recovery Corporation completes job, dissolves

PITTSBURGH—Here is the story of a government agency which is voluntarily going out of business after successfully completing its job. This agency has spent less than one per cent of what the government expected it to spend, and is a graphic example of advantages accruing from the application of business methods in government.

This is the story of Steel Recovery Corporation, which closed shop here December 31.

The federally sponsored Steel Recovery Corporation wound up its affairs with a record of having effected savings on government purchases of supplies nearly equal to the entire cost of its operation, Charles F. Cruciger, president, points out. This record is unique, in the opinion of the steel men who directed the emergency program for moving idle and excess steel into war-useful channels.

Release of personnel, which reached a total of 549 at the peak of operations, has been in progress since September 30, last year.

Presently outstanding contracts and obligations will be completed. These were undertaken by the corporation as an agent of the RFC-owned Metals Reserve Company under the salvage program of the War Production Board. Future redistribution of idle and excess steel will be carried on by regional offices of the WPB.

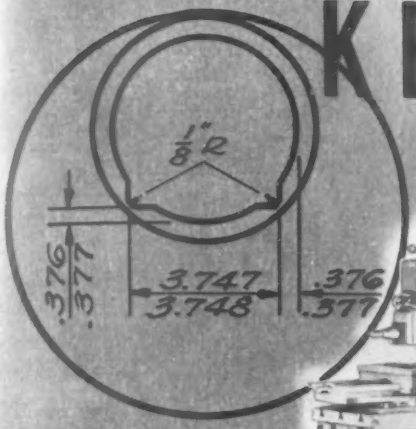
Steel was handled by the corporation in a variety of types and shapes, and with savings not only of irreplaceable production time but, in many cases, of cost to the government.

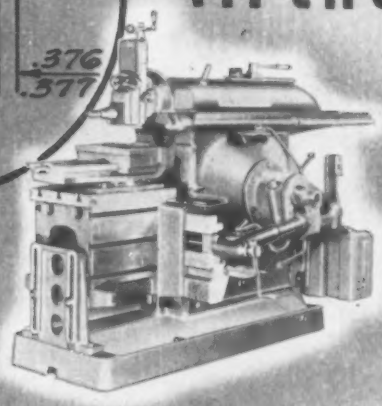
"In one transaction alone," according to Mr. Cruciger, "we were able to save the government the equivalent of a very substantial portion of the total cost of our operations. In connection with the manufacture of service men's identification tags and chains, we located and purchased idle stainless steel, formerly used for ice pans in refrigerators, making possible the substitution of this material for silver. In this single deal a unit cost saving of over thirty cents was effected on government orders totaling more than seven million units."

Steel Recovery Corporation activities included the reduction and redistribution to manageable proportions steel inventories rendered idle and excessive by war emergency freezing orders and variously estimated before the agency was formed in the summer of 1942 at from 12,000,000 to 15,000,000 tons. A total of some 547,000 separate items were located in the possession of 47,000 different holders.

(Continued on page 124)

KEY WAYS ...the right way!





. . . . Internal shaping is another function of the Shaper requiring accurate performance. Here a Cincinnati Shaper holds close tolerances cutting Kennedy Key Ways in an eccentric.

Write for Catalog N-2

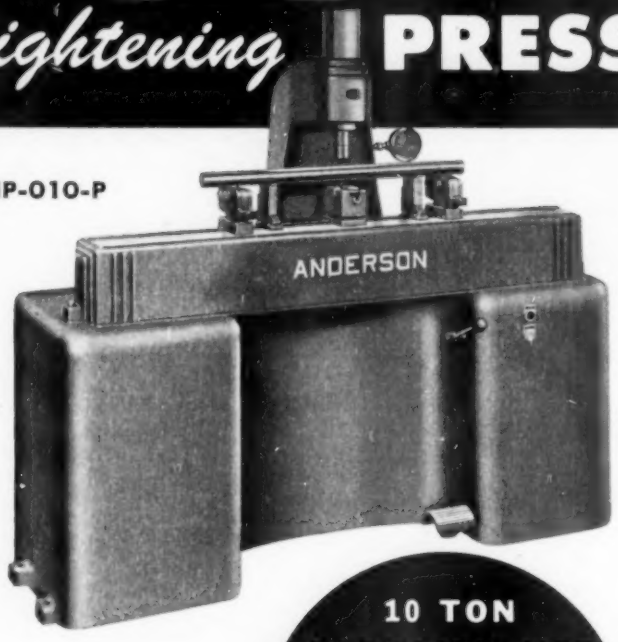
THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

HYDRAULIC POWER Straightening PRESS

Model HP-010-P



10 TON CAPACITY YET SENSITIVE ENOUGH TO BEND SHAFT A MINIMUM OF .001"

Speed Up Your Checking and Straightening Jobs

The latest and most practical type of power press . . . sensitive, speedy, accurate. Developed to supplement the highly successful line of Anderson Hydraulic Hand Presses. With a capacity up to 10 tons it is so sensitive and so accurate that a shaft may be bent as little as a .001 of an inch.

The pressure gauge, indicating ram loading, is mounted near the work at eye level to facilitate quantity production. Beneath the ram, at the point of maximum deflection of the work piece, is located an adjustable dial indicator. This indicator clearly shows amount of shaft run-out in pre-loaded, fully loaded, and unloaded positions.

Use of the Hydraulic system on this press provides distinct advantages over conventional types.

A flexible, sensitive control of press is made possible by means of a unique rotary control valve. This valve is operated from the front of the machine by a control lever which, when depressed, causes a corresponding increase in the load applied to the work. An infinite range of loading up to capacity is obtainable as the lever is moved from 0 to maximum displacement. Push button control of the hydraulic unit is provided for starting and stopping, although no load can be applied to the ram until the lever is depressed.

The length of press work table is 60 inches. Available table attachments include checking rolls, spring loaded centers, adjustable anvils and indicator. To further aid production speed, an adjustable stop collar is provided which may be used to limit the 6" maximum stroke of the ram. Hand operated control equipment is standard but extra provision can be made for foot operation upon request.

ANDERSON BROS. MFG. CO.
Anderson
ROCKFORD, ILL. U.S.A.

Write for Bulletin 110

(Continued from page 122)

The steel recovery program functioned principally as a clearing house where buyer and seller were brought together promptly. The Corporation purchased materials for reprocessing for vital armed service needs and, where occasion warranted, for remelting. According to officials of the corporation, the entire program was accomplished at a per ton cost of less than normal brokerage fee, and only a small percentage of the funds available for the program was used.

At the outset, estimates were made that an outlay of $300,000,000 might be required to maintain capacity production in the nation's steel mills by assuring an uninterrupted flow of scrap. The corporation completed its work with a total expenditure of approximately one percent of this amount.

The story of the Steel Recovery Corporation's program, undertaken at the request of the War Production Board, covers a period of less than a year and a half. It is essentially that of a group of practical steel men who met on government call, organized and directed a rush compilation of information on idle and excess steel on a scale never before attempted, acted vigorously to move the steel into vital war production, and then, the corporation's mission accomplished, voted to disband.

METALLIZING

● Cash awards made for practical ideas in saving time, materials

LONG ISLAND CITY, N. Y.—In the first of its new series of Conservation Contests, Metallizing Engineering Company has awarded cash prizes to production engineers for practical applications of metallizing in saving critical metals and manufacturing time.

The contest is open to users of any type of metal spraying equipment. First prize of $200 was awarded to R. C. Overstreet, Tinnerman Products, Incorporated, Cleveland, for his description of a faster, more durable way to protect Speed Nuts against corrosion.

A $100 second prize went to L. W. Sagle, Baltimore & Ohio Railroad, for procedures showing how replacements are avoided and worn parts reclaimed quickly and cheaply.

Other cash prizes were awarded for these ideas: Building up an undersize rudder stock for a dredge; salvaging discarded press rams; replacing nickel-chrome in the Gasogene unit with metallized cast iron; copper and zinc coatings on steel to replace solid aluminum for radio transmitter frames; a method for spraying aluminum on steel magnet inserts.

MEEHANITE MEETING

● More than 200 foundries represented; New officers elected

CINCINNATI—More than 200 representatives of Meehanite foundries from all parts of the United States and Canada gathered here recently for the Second War-Time Meeting of the Meehanite Research Institute of America.

The Institute, whose headquarters

(Continued on page 126)

HOW TO CHOOSE YOUR TOOLS

Simply and Scientifically

TANTUNG
"FILLS THE GAP"

UP TO 90 SURFACE FEET PER MINUTE *use* HIGH-SPEED STEEL TOOLS

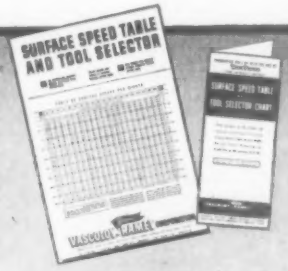
HIGH-SPEED STEEL TOOLS have their place at the slower speeds indicated. At higher speeds, these tools require frequent grinding, production suffers and valuable time is lost. They cannot approach the production-per-grind that is possible with Tantung Cast Alloy or Cemented Carbide Tools.

BETWEEN 90 AND 190 SURFACE FEET PER MINUTE *use* TANTUNG CAST ALLOY TOOLS

TANTUNG "fills the gap" between High-Speed Steel and Carbides. It cuts rolled, forged or cast steel, annealed or heat treated, and any material that can be machined. Operates at greater speeds, heavier cuts, heavier feeds, produces more pieces per grind and better finish than high-speed steel. Write for the new Tantung Tool Catalog today.

FOR HIGHER SPEEDS *use* CEMENTED CARBIDE TOOLS

VASCOLOY-RAMET CARBIDE TOOLS were the first successful cemented carbides developed for machining steel. The superiority of Vascoloy-Ramet Carbide is due to the inclusion of Tantalum Carbide, an extremely hard material that imparts a self-lubricating action which minimizes cratering or chip wear. Highest quality.



FREE WALL CHART

See at a glance Table of Speeds, Feeds and Tool Selector. Chart shows when to use High-Speed Steel, Tantung or Carbides to best advantage. Printed in color, on heavy stock, ready to hang. Reprinted by popular demand. Advise how many Wall Charts your plant will need.

FREE POCKET CHART

The same Table of Speeds, Feeds and Tool Selector is available also in a Pocket Size Chart for operators as well as supervisors. Advise how many Pocket Size Charts your plant will need.

Vascoloy-Ramet high standard of quality is measured by results rather than price. Vascoloy-Ramet Corporation and the Fansteel Metallurgical Corporation (world's foremost producers of Tantalum) work hand in hand to assure tool users peacetime quality under wartime conditions.

VASCOLOY Ramet RAMET CORPORATION

NORTH CHICAGO, ILLINOIS • DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES

(Continued from page 124)

are in New Rochelle, New York, announced that in spite of war-time difficulties, research activities by the metallurgical group have been accentuated during the year. More than 50 technical papers were presented at the conclave.

Oliver Smalley, Meehanite Metal Corporation, New Rochelle, N. Y., was elected president at the directors' meeting.

H. B. Hanley, American Laundry Machinery, Rochester, N. Y., was named vice president, and C. S. Nichols, Meehanite Metal Corporation, Chattanooga, Tennessee, was made secretary-treasurer.

PRICE REDUCTION

● Carboloy cuts prices 12-20 per cent; introduces new grades

DETROIT — Attributing substantial savings to manufacturing economies resulting from the mass production of standard single point tools, Carboloy Company, Incorporated, has cut prices on its cemented carbide tools 12 to 20 per cent.

With these reductions, Carboloy says the prices of its Cemented Carbide standard cutting tools generally are comparable with those of virtually any cutting tool material.

The reductions, the second made in recent months, affect grades both for steel cutting and machining non-ferrous metals, cast-iron, and non-metallics. The new list prices apply regardless of quantity ordered.

Addition of grade 78-C to the standard tool line for sizes of ¾" or more was announced at the same time. The new grade, designed for machining steel parts on large, heavy duty machines, is described as exceptionally tough and shock resistant and is particularly effective for interrupted cuts.

Shanks have been lengthened on 14 standard tool sizes and minor revision made in a few tip dimensions to conform to proposed WPB standards.

ORGANIZED

● Cutting Tool manufacturers form National Association

DETROIT—A National Association of Cutting Tool Manufacturers was launched here December 10 by representatives of more than 100 manufacturers of cutting tools, who registered as "temporary members" pending the formation of the Association proper.

To expedite the formation, the meeting elected a temporary Board of nine Directors, with W. G. Robbins, Carboloy Company, Incorporated, Detroit, as chairman.

Other members of the Board are: Oscar L. Bard, President, Michigan Tool Company, Detroit; H. R. Conner, Vice President, Detroit Broach Company, Detroit; George W. Frick, Manager, Firthite Tool Division, Firth-Sterling Steel Company, McKeesport, Pa.; E. A. Goddard, Vice President, Goddard and Goddard Company, Detroit; Norman Lawton, Partner, Star Cutter Company, Detroit; R. G. Michell, President, Eclipse Counterbore Co., Detroit; R. M. Severance, President, Severance Industries, Inc., Saginaw, Mich.; and R. H. Wolfe, President, Arrow Tool and Reamer Company, Detroit.

Decision to form the Association on a National basis was voted as a result of numerous problems facing the industry throughout the country and the desire of tool companies outside the Motor Capital to participate.

The temporary Board is charged with the responsibility of developing by-laws and formulating definite plans of organization and membership.

Among the objectives visualized are assistance not only to the cutting tool industry, but also to governmental agencies on such subjects as renegotiation, taxes, contract cancellation and termination, and disposal of surplus cutting tools by the armed services.

Standardization of cutting tools to permit greater simplification of production equipment and methods is another subject the Association is expected to study.

Except for assistance to the armed services in the disposal of surplus war equipment and facilities, the Association agreed to have nothing to do with either pricing or marketing of tools.

On the subject of contract cancellation, it was pointed out that tool manufacturers usually are sub-sub-subcontractors and frequently have to hold up production for months without being able to obtain financial settlement on the part of contracts already completed.

It was suggested that experts be selected from the Association to assist the government on disposal and utilization problems. The Board of Directors is considering the appointment of subgroups to help streamline activities pertaining to manufacturers of specialized types of tools.

All producers of cutting tools will be given an opportunity to become members from the outset, it was decided, regardless of their location.

The meeting was arranged by an organizing committee consisting of E. C. Putnam, President, Putnam Tool Company; W. G. Robbins, President, Carboloy Company, Incorporated; Emil Gairing, President, Gairing Tool Company; and George Sheldrick, President, Midwest Tool Company.

(Continued on page 128)

AIRCRAFT PRODUCTION

Production continues upward, as early problems are ironed out. Will post-war aviation lay an egg? Henry Ford plans for tomorrow

● **The long,** hard struggles with machines, materials and manpower begin to look as if they had been won. Aircraft production for October made the production news of the month, and the national production chart continued to display a sharply inclined monthly output line in November.

By October, the schedule of 100,000 units annually had been achieved with a month's total output of 8,362 ships. Early reports for November indicate that output soared to a figure slightly under 9,000 units.

From the West Coast, government-approved figures confirm the speculated 9,000 total, and prove that things are looking up to the country's Number One wartime industry.

In November, West Coast aircraft plants turned out 2,581 warplanes, as against 2,496 the preceding month. Noteworthy, from a production-problem standpoint, is the fact that some 600 of these planes were heavy four-engine bombers, or 60 per cent of the national production.

Thus, fighting ships are rolling off West Coast assembly lines at the rate of nearly 100 a day, one every 15 minutes. That's real production.

Though they don't say so specifically, many of the "publicity" stories on aircraft production printed in the daily press infer that the "we-never-produced-aircraft-before" boys are beating the pants off the old-line, West Coast builders. Here are some facts.

Boeing, Consolidated Vultee, Douglas, Lockheed, North American, Northrop and Ryan have midwest plants. In October, these six companies turned out about 4,000 planes, approximately half of the national total.

● **Production** men interested in authoritative opinion on the post-war prospects of aviation as a mass production industry might take cognizance of the recent remarks of W. A. Patterson, president of United Air Lines.

Today's talk about a vast expansion of America's aeronautical industry after the war is "highly illusory," this veteran airman says. Patterson ridicules the idea that the helicopter will be the flivver of tomorrow, says there will be little need then for the airplane's speed.

Regarding the war-born pilots, Patterson says, "They'll find the expense of flying, and of servicing and storage prohibitive. The railroads are preparing new competition for the airplane—increased speed, more comforts and lower fares."

Patterson's remarks on the possibility of post-war plane manufacture by the auto industry make interesting reading. "I take no stock," he said, "in the talk that the big automobile industries will enter the aeronautical field. It is much more likely that the aircraft builders will turn to building automobiles."

● **This gloomy outlook** for the plane-builders fails to dim the ardor of Henry Ford, who has announced: (1) That more than 1,000 B-24 Bombers have been flown away from Willow Run this year; (2) that he is designing for post-war production a "new" plane; and (3) that his option on Willow Run has been confirmed.

Wire Department EX

FOR GAGES YOU NEED IN A HURRY!

Standard Thread, Plug and Ring Gages—sizes No. 4 to 1½", and many other minor diameter plain plugs—are carried in stock for prompt shipment by air express, rail express or mail.

Due to varying demands on this stock, we cannot always guarantee immediate delivery, but we do positively guarantee that every Gage carrying the PM Diamond Emblem conforms to the industry's highest standards of accuracy, finish and quality.

Wire Department EX for prompt service. Refer to your PM Gage and Small Tool Manual for complete information—and write for a new copy of this useful book if you need it.

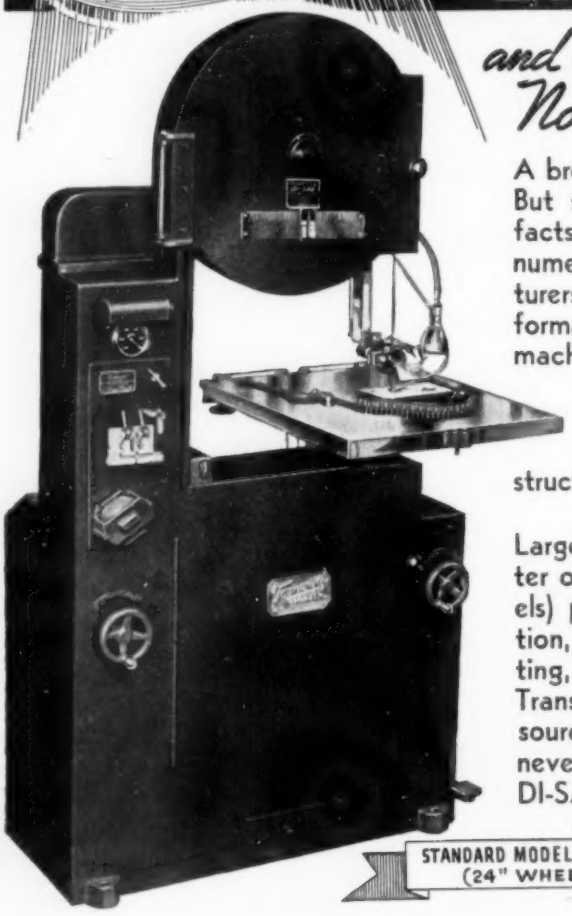
PM CO

The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS

INVESTIGATE Tannewitz DI-SAWS

and You'll Want No Other!



A broad statement? Yes. But soundly founded on facts—the experience of numerous large manufacturers — the actual performance records of the machines, themselves — and fundamental superiorities of design and construction.

Larger wheels (24" diameter on the standard models) provide greater traction, faster, straighter cutting, more production. Transmissions, common source of die saw grief, never fail in TANNEWITZ DI-SAWS.

STANDARD MODEL No. M24 (24" WHEELS)

Sturdier, heavier construction throughout, plus many refinements of design, make these machines the greatest, trouble-free producers in their field. It pays to buy the best!

With a TANNEWITZ DI-SAW you can do in minutes jobs which require hours by the shaper, miller or lathe methods.

Get the complete facts. Just write for DI-SAW bulletin.

Other Models to Handle Work of Practically Any Size

Made with 30", 36", 48" and even larger throat capacities if desired, the TANNEWITZ "Big Bertha" models make available the tremendous savings of inside and outside sawing, filing and polishing on dies, jigs and other work of practically any size. Write for bulletin.

On request: Bulletins on Single and Variable Speed Foundry Band Saws; Sheet Metal Cutting Band Saws.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

INDUSTRIAL NEWS DIGEST

(Continued from page 126)

INDUSTRIAL BUSINESS NOTES

INDUSTRY REPORTS

● News of expansions, purchases and new services

New Branch offices: Three in Ohio for the Colonial Broach Company, Detroit. Producers of broaches and broaching equipment, Colonial's newest direct branch offices to be opened are in Toledo, Cleveland and Dayton.

Morris Teague and W. F. Haverstock will head the Toledo office in the Toledo Trust Building. George Pierce is District Manager for the Cleveland area, with offices in the Penton Building. The Dayton office, in the Harries Build-

(Continued on page 130)

Jack and Heintz Production and post-war plans

CLEVELAND—When Bill Jack announced the news the 7,600 employees of super-charged Jack and Heintz cheered.

The news: An order from the Navy to double production with the same manpower, turn out a whopping new contract for $150,000,000 worth of airplane starters, automatic pilots and similar precision instruments.

●

Can the revolutionary management methods developed by Bill Jack and Ralph Heintz turn the trick? Jack, stocky, voluble ex-union leader, and his partner Heintz, tall, quiet engineering genius, say they can. So do their workers, who put in a seven-day, 82-hour week, and haven't recorded a day of unauthorized absenteeism since February, 1943.

But Jack and Heintz, now among the top volume war producers, have other worries. Taxes and their post-war plans aren't jelling. The two men, whose methods were described in The Tool Engineer magazine, September, 1943, have promised their "associates" full employment when war ends. To do that, they believe they should be allowed to set aside five per cent of profits, after taxes. Renegotiation, before taxes they say, would leave them nothing for their post-war program.

●

"The smaller firms can all be eliminated with the end of the war unless they are permitted to pile up reserves," Jack said recently. "The government could place restrictions upon these reserves to make certain that they were not dissipated. Thus the large companies, working on a cost-plus basis and with plenty of capital, would not be able to grab up everything.

"We know we can keep our workers going by new developments when the war ends, if we are left sufficient capital.

"We don't want unemployment for our 'associates' ".

a HARD and FAST rule

TO PRODUCE BETTER PRODUCTS AT LOWER COST

CATERPILLAR Tractor Company's progressive engineers use the "hard and fast rule" of TOCCO Induction Hardening to improve their products and cut costs.

On gears, for example, TOCCO's speedy, localized heating minimizes the distortion problem, permits *machining first*, then hardening . . . *real hardening*, uncompromised by the need for machining afterward.

Results for the 25.7" diameter, 275-lb. "final drive gear" of "Caterpillar's" big 17.5-ton D-8 tractor:

LONGER LIFE. TOCCO hardening applies heat-treatment quickly to wearing surfaces, minimizes distortion, permits maximum hardening of gear teeth and thus helps to reduce wear.

SAVES NICKEL. Use of plain carbon steel instead of alloy steel is saving 144,000 lbs. of scarce nickel per year.

CUTS TOOL WEAR. Fellows' shaper cutters had to be reground after four gears. Crown-shaping tools now last for hundreds of gears.

SPEEDS PRODUCTION. Heating time 90 seconds. Quenching time 34 seconds. Floor-to-floor time about 4 minutes per gear.

A far better product at lower cost. Aren't these *your* objectives . . . now and post-war? TOCCO engineers are at your service.

THE OHIO CRANKSHAFT COMPANY
Cleveland, Ohio

Weight of gear . . 275 lbs.
Pitch diameter . . . 25.7"
Face of teeth . . . . . 5"
Steel . . . . . S. A. E. 1045
Final hardness . 55-60 R.C.
JUST PUSH A BUTTON
TOCCO
HARDENING, BRAZING,
ANNEALING, HEATING

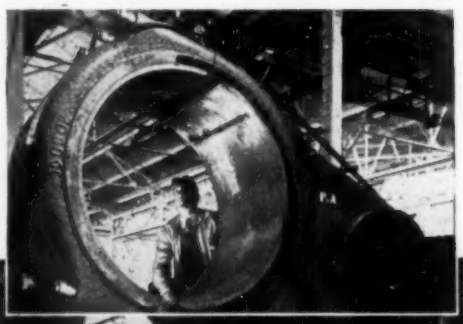
PRODUCTION PIX

WHAT'S DOING IN THE WORLD OF MASS MANUFACTURING

Right—Newsworthy is this shot of a workman removing an aluminum alloy aircraft engine crankcase section from the die of a forge hammer.

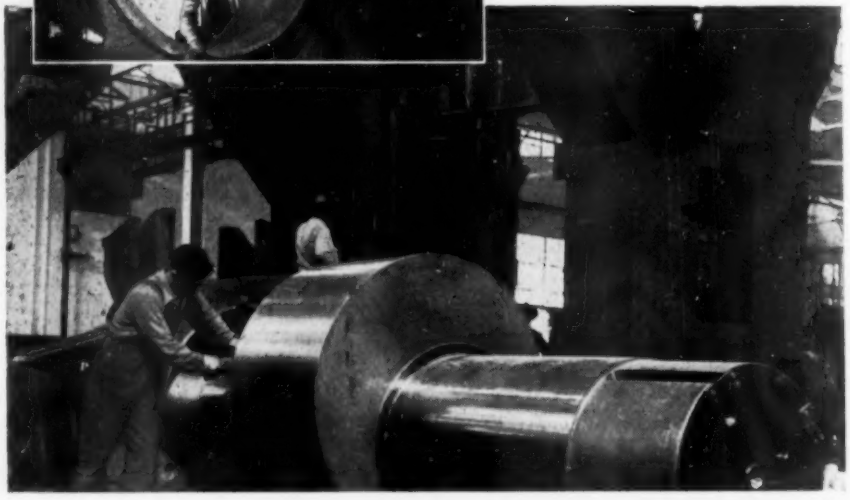
The scene is in a shop of the Aluminum Company of America, which now has 45 times more forging capacity than it had at its peacetime peak.

National production of the metal is nearing an annual rate of 2,100,000,000 pounds.



Left and below — Outstanding among press units in Chevrolet's new Anderson, Indiana, aluminum forge plant are four 4,000-ton clearing mechanical presses.

The connection strap, or "connecting rod", for each 23-foot-high press weighs 10 tons. Below is the 20-ton crankshaft used in each forging unit in the conveyorized shop.



Right—Though theirs is the most hazardous occupation in Murray Corporation shops, die tryout men there have rolled up an impressive 385, 184 man-hours worked without an accident.

Lesson to be learned from the 21 months record is that safety rules must be observed every hour on the job, that accident rates often are higher on "safer" jobs.

INDUSTRIAL NEWS DIGEST

(Continued from page 128)

ing, is headed by H. E. Roedte

* *

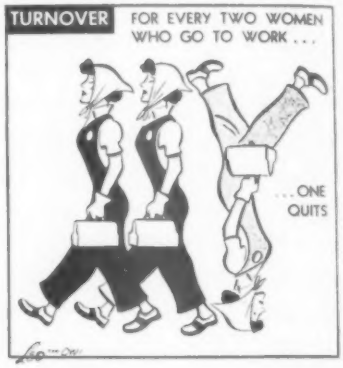
New Cooper-Bessemer office: Opening of another Pacific Coast factory branch office has been announced by officials of The Cooper-Bessemer Corporation, 110-year-old engine builders with plants at Mount Vernon, Ohio and Grove City, Pennsylvania.

The new office, in the Rust Building, San Francisco, is the third branch serving the west coast area. The others, long established, are in Los Angeles and Seattle.

According to company spokesmen, the new Golden Gate branch, headed by J. G. McKissick, will facilitate the installation and maintenance of the concern's Diesel engines in ships constructed in northern California.

* *

Mack wins award: Presentation of the National Security Award to Mack



Manufacturing Corporation has been announced by the Office of Civilian Defense, Washington. Mack, peacetime producer of Mack trucks and war-time manufacturer of a varied line of military items, is one of five recent recipients.

The award is granted by OCD to plants and facilities which have achieved outstanding success in programs for the protection of employees, plants and production or service operations against fire, explosion, air raid, and accident.

* *

New Genesee Tool offices: Six new factory service and sales district offices have been opened by the Genesee Tool Company, Fenton, Michigan.

This cutting tool producer's new offices are located in: Harries Building, Dayton, Ohio; Penton Building, Cleveland; Tower Building, South Bend, Indiana; Toledo Trust Building, Toledo; Grant Building, Pittsburgh; and Fletcher Trust Building, Indianapolis.

* *

Boom Baldwin business: The Baldwin Locomotive Works, Philadelphia, states that locomotives on order for the U.S. Army and Lend-Lease in 1944, together with locomotives to be constructed for domestic use, represent the greatest locomotive business on the books at one time.

Besides building locomotives, Baldwin was a producer of Army tanks during most of 1943. The company's tank production was completed recently, and reconversion of all facilities already is under way.

Production of other Baldwin products will not be affected by the stepped up locomotive schedule, it was stated by

(Continued on page 132)

VAN NORMAN HIGH FREQUENCY INDUCTION HEATING

Section of tube brazed by Van Normanizing. Heating time—6 seconds.

In the illustration, collars are brazed to tubes in 6 seconds with Van Norman High Frequency Induction Heating. Bonds are clean, tight and uniform. The finished part has no discoloration and is free from scale, thus cleaning operations, which are usually necessary when torches and other brazing methods are used, are eliminated, spoilage is minimized, and piece after piece is brazed with the same uniform results. Obviously, VAN NORMANIZING produces a better finished part, speeds output and reduces costs.

By using the proper work-holding fixture and heating coil, a number of workpieces can be brazed simultaneously. Odd-shaped parts are just as easily brazed by Van Norman High Frequency Induction Heating as uniform parts.

It will pay you to investigate Van Norman High Frequency Induction Heating for Hardening, Brazing, Soldering, Annealing and other applications requiring localized heat.

It pays to Van Normanize

ARMY E NAVY

Van Norman Company

SPRINGFIELD 7, MASSACHUSETTS

BY USING VICTORY TOOL SHANKS

1. Victory Tool Shanks cast of tough, long-lasting Meehanite Metal eliminate the use of much critical steel. You cement carbide tips directly to the non-critical cast shanks. 2. They lengthen tool life — because the coefficient of expansion of Meehanite is closer to that of carbide than is steel. That means a much better bond. 3. They protect tool life — because Meehanite has twice the damping capacity of steel, and so reduces chatter and vibration. 4. They speed up work in grinding — because Meehanite does not load the grinding wheel as rapidly as steel. 5. They save precious time — because they require a minimum of machining before use.

WRITE for a copy of Bulletin No. 53 T-2 which illustrates standard sizes stocked for immediate delivery. Pick out a size you can use and ask for free samples. Prove for yourself, in practical use, the superiority of Victory Tool Shanks.

THE
Cooper-Bessemer
CORPORATION
DEPARTMENT E., MOUNT VERNON, OHIO

INDUSTRIAL NEWS DIGEST

(Continued from page 130)

Charles E. Brinley, chairman of the board. The company and its subsidiaries will continue building other war products, including Diesel locomotives and engines, ship propellers, gunmounts, hydraulic presses and turbines, testing equipment, steel forgings and castings.

* *

General Motors: The Saginaw Malleable Iron Division of this motor manufacturer has been asked by the government to operate a plant to be built and equipped by the Defense Corporation near Danville, Illinois, C. E. Wilson, GM president, has announced.

The single story plant, for the manufacture of malleable castings for heavy duty truck axles, covers 130,000 square feet.

"Employment in the plant is expected to approximate 500 when full production capacity is reached," Wilson said.

* *

American Propeller expansion: Additional equipment costing approximately $900,000 has been approved by DPC for the big American Propeller Corporation's facilities at Toledo, Ohio. Over-all commitments of this Aviation Corporation subsidiary now total approximately $12,400,000. Product manufactured is the hollow steel propeller blade for combat aircraft (see The Tool Engineer, November, 1943).

* *

Western Electric Subcontracting: Probably a record for large concerns is Western Electric Company's subcontracting of 50 per cent of its total production of war materials since December, 1941. These subcontractors, the company has announced, now total 6,500.

Explaining how the record 50 per cent subcontracting was attained, the company states that a full year before the United States entered the war, a production planning board was set up within the company to devise effective means of speeding output if war actually developed.

A part of this planning took the form of a nation-wide survey to catalogue those allied communications factories that could be utilized as subcontractors. Hundreds of such smaller plants were classified as to their manufacturing facilities, skilled personnel, location and probable production capacities.

* *

Baldwin sales appointment: John C. Graf has been named sales manager of the hydraulic press and special equipment department of Baldwin Southwark division, The Baldwin Locomotive Works. F. G. Schranz, division vice president, made the announcement.

Graff entered the employ of the Southwark Foundry and Machine Company, now the Baldwin Southwark division, in 1915.

* *

Congratulations: From Rear Admiral W. H. P. Blandy, U. S. Navy, Chief of the Bureau of Ordnance, to the H. K. Porter Company, Incorporated, Pittsburgh, for outstanding performance in the production of naval ordnance material.

Porter "gunnery installations, including your 6" breech blocks, have received high praise", the message read in part.

* *

Branch office: In the Toledo Trust Building, Toledo, Ohio, for the Michigan Tool Company, Detroit, producers

(Continued on page 134)

50 to 3000

Pounds Pressure from your Present Hydraulic Circuits

with a

RACINE

Hydraulic Pressure BOOSTER

A high pressure, oil hydraulically actuated, compact, self-contained auxiliary to your present low pressure hydraulic circuit. Increases your source of force as much as 7 to 1. Creates new standards of flexibility and operating economy.

FOR NEW OR OLD HYDRAULIC CIRCUITS. Fits anywhere into your present or new hydraulic circuits without interference. Now you can obtain *high pressure when you need it—return to low pressure at will.* Use low horsepower motor and low pressure control valves—results in lower initial investment and reduced operating and maintenance costs.

Can be used in circuits with either variable or constant volume pumps.

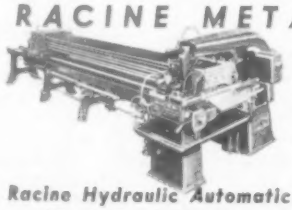
Free from repairs — no gears to wear out — no driving mechanism to get out of adjustment. The Racine Hydraulic Pressure Booster is an exclusive patented unit. For complete information ask for illustrated bulletin. Address Dept. TE-P.

"Variable Volume" PUMPS
"Balanced-Piston" VALVES

Include in your hydraulic circuits Racine Oil Hydraulic "Vane Type-Variable Volume" Pumps. Capacities 12 - 20 - 30 G.P.M. Operating pressures 50 to 1,000 pounds per square inch. Racine "Balanced-Piston" Valves insure ease of operation. Sizes ⅜" to 1½". Available with manual, solenoid, pilot and mechanically operated devices. Let Racine engineers help you with your oil hydraulic applications. Ask for Bulletin P-10-C.

Racine "Variable Volume" Oil Hydraulic Pump

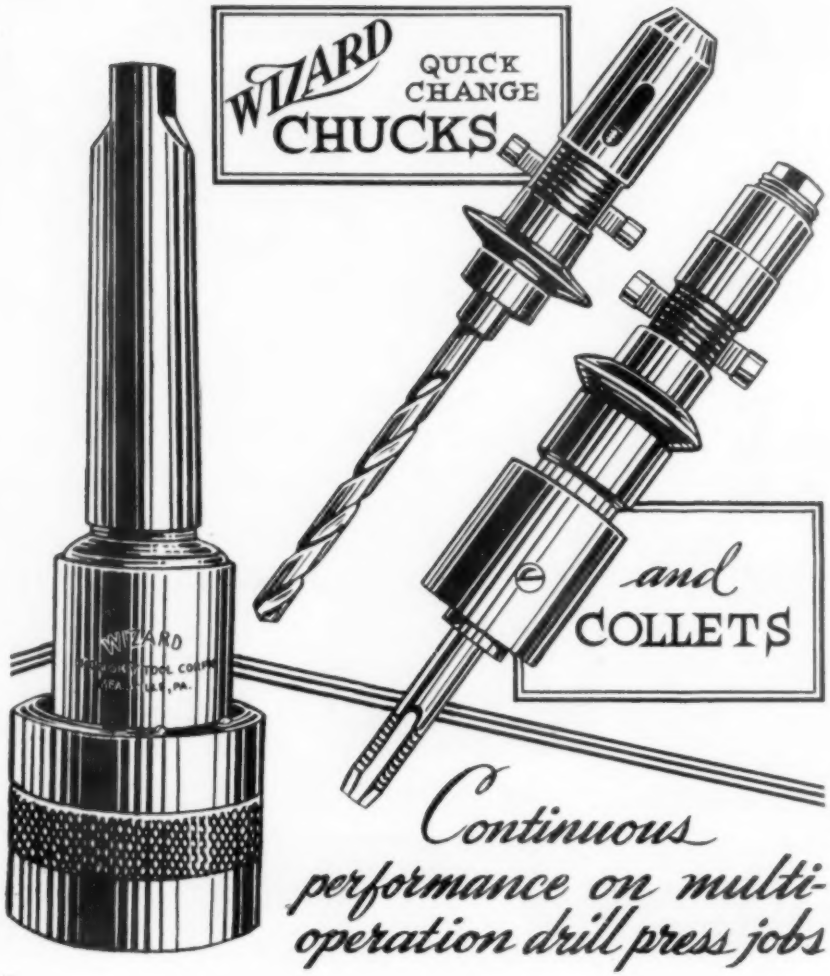
RACINE METAL CUTTING MACHINES



Racine Hydraulic Automatic Stock Feed Machine

For 36 years Racine has led the field in metal cutting machines. Positive screw feed and the application of hydraulic operation, feed and control to metal cutting machines of the reciprocating type, were first developed by Racine. A full line—capacities 6" x 6" to 20" x 20".

RACINE
TOOL and MACHINE COMPANY
Standard for Quality and Precision
RACINE, WISCONSIN, U. S. A.



WITH a McCROSKY WIZARD Outfit an operator can change tools quickly and easily without stopping or slowing the spindle. To insert the tool, he merely pushes the collet into the revolving chuck; the positive automatic latch instantly locks the tool in place. To release, he puts slight finger pressure on the knurled collar of the chuck; the collet releases instantly and drops into the operator's hand. Because the WIZARD Chuck holds tools rigid and centered, it can be used horizontally as well as vertically.

For Chuck & Collet Manuals and Bulletins
write to McCROSKY, MEADVILLE, PA.

COST CUTTING TOOLS

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

(Continued from page 133)

of gear production equipment, Cone-Drive gearing and gear cutting tools.

The new factory service and sales district office will be supervised by M. E. Teague and W. F. Haverstock, according to P. F. Zerkle, company sales manager.

* *

Spray painters training: To train operators — beginners and veterans — in faster, more efficient finishing methods, DeVilbiss is opening to them four one-week sessions in the first half of its 1944 School of Spray Painting to be held at its Toledo plant.

All applicants using DeVilbiss equipment on their jobs will be admitted free to sessions which begin January 10, February 14, April 16 and May 15, the company has announced. Classroom instruction and shop work will be conducted by spray painting experts at all four sessions. Information and reservations may be obtained from the DeVilbiss Company, Toledo 1, Ohio.

* *

Manufacturing rights: For Meehanite Castings by the Russell Allport Company and Pty. Ltd., Hobart, Tasmania. The announcement comes from the Australian offices of the Meehanite

(Concluded on page 136)

A Real Veteran

Syracuse Post Standard photo

Johan H. Reimer, 90-year-old tool maker, checks a flush-pin gage.

Patriotism has brought many an old-timer out of retirement to contribute to the war production effort. Of these, few may be as newsworthy as 90-year-old Johan H. Reimer of Syracuse, New York.

Born in Germany, he is a 100 per cent American who retired from his trade as a tool maker years ago when the Franklin Automobile Company disbanded. On November 11, 1942, he donned a shop coat again, went to work for the Precision Tool and Manufacturing Company in Syracuse.

"Reimer has worked an average of 10 hours a day, six days a week and hasn't lost a day's work," Charles R. Gibbons, president of Precision Tool says. The veteran tool maker is employed at machine operations on experimental and production parts.

We're set to move fast!

Our well known speedy delivery policy steps up its pace when it comes to mounted points and small internal grinding wheels. For larger NUBON Wheels, we guarantee ten-day service. But it's *overnight delivery* on these small wheels, if you need them that fast!

Designed to perfection — NUBON Wheels, big AND small, in thousands of sizes and shapes, are custom made and engineered to a degree of precision that has made them the choice of leading American war plants everywhere.

Our special bonding process saves hours — gives you fast delivery — and places us in a unique position to solve your toughest grinding problems.

Send today for your copy of our new catalog. It's a reference "library" well worth having.

UNIVERSAL WHEEL & ABRASIVE CORP.

2626 West Van Buren Street, Chicago 12, Illinois

NUBON 24 HOUR PROCESS GRINDING WHEELS AND STONES

Carefully Tested Steels Insure WELDON Quality

To check accurately the exacting specifications of the high speed steels used in WELDON cutting tools, exhaustive chemical and physical tests are made by a staff of highly trained experts in the WELDON metallurgical laboratories.

No expense has been spared to provide these laboratories with the most complete and modern equipment necessary for thorough test and micro-analysis.

As a result the high quality of WELDON materials is safeguarded and the dependability of WELDON Tool performance is insured.

We can make immediate shipment of most sizes of WELDON End Mills. Write for stock list.

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

INDUSTRIAL NEWS DIGEST

(Concluded from page 134)

Metal Corporation.

This Tasmanian company operates the largest foundry on the island, and for more than 50 years has been supplying general castings for industry.

* * *

Appointment: Michigan Tool Company, Detroit, manufacturers of gear production tools and equipment, announces that P. F. Zerkle has been put in charge of direct sales.

Also announced is the opening of branch offices in Dayton and Cleveland. George Pierce is managing the Cleveland office, located in the Penton Building. Manager of the Dayton branch, 710 Harries Building, is H. E. Roedter.

Expansion: Detroit Tap and Tool Company has opened a factory branch office at Toledo to serve the industrial area surrounding that city. Service engineers at the new branch include M. Teague and W. F. Haverstock.

The company's recently expanded line includes tapping machines, tap reconditioners, precision ground thread production tools and gages, and thread milling cutter checking equipment.

—CAPITAL COMMUNIQUE—

(Concluded from page 112)

lem of finding storage if the using industries were not faced with getting them out of the way.

The machines would be priced individually, on a pre-war price basis—on some standard tools the 1937 selling prices were 65-70 percent of those current now, and some depreciation should be further figured for years in use.

It was only last month that machine tool industrialists were expressing fears of just such a situation, in which their market would be killed for anywhere from 10 to 20 years, by the presence of these machines.

Some hint of a possible easing of this threat is seen in a recent revelation that more than 17,000 metal-cutting machine tools have been sent to Soviet Russia alone, in this war. Presuming that some of this equipment has been lost en route, other quantities perhaps destroyed in the shifting tide of war, and some of it deteriorated through war use, there may still be a considerable market abroad for surplus American machines.

CUTTING TOOL MATERIALS

The trend of machine tool shipments for use of United States industries, meanwhile, continues downward, declining 11 percent in the October report from September, and the backlog of unfilled orders for machine tools likewise dropping steadily.

In connection with the post-war types that may be seen, or those coming into production after this, an interesting development is reported unofficially. Location of new metal ores, new use of scrap, and new supplies of component materials, have eased the metal supply so substantially, that specifications for machine tools may soon be stepped up. Molybdenum, once extremely tight, is now reported to be available in sufficient quantity so that tool makers may get all they need for essential production, and the specifications tightened accordingly. THE END

No Slide Rule Formula

The Cleveland Automatic Machine Company's "Production Cost Patrol" is an engineering service. Its purpose is to provide a competent "outside approach" to your turning and forming problems, and, working in co-operation with your production experts, to seek out hitherto undiscovered waste in production methods.

Engineers who would come to your plant to perform this service do not merely ask a few questions, whip out a slide rule and a convenient formula for making changes. Instead, a thorough study of methods is made. Wherever possible, specifications of pieces in production are taken and samples produced by methods our engineer works out. If the new method affords improvements in cost and production, you are given a full report on the comparison between present and proposed methods, detailing every unit of time, manpower and equipment involved . . . showing not only HOW but WHY.

The steps to bring about such a study in your plant are simple . . . (1) Upon request you will be given a statement of our engineer's method of surveying your plant, and his credentials will be submitted. (2) The engineer will spend as much time as necessary in your plant, making detailed studies, without interrupting production. (3) A detailed written report will be made for you, with proposals for changes in method wherever opportunities for savings are found.

Write or wire for further information

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND, OHIO

SALES OFFICES

CHICAGO: 1408 Civic Opera Building
DETROIT: 540 New Center Building
NEWARK: 902 American Insurance Building
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NEED
STANDARD DIE SETS
OR
DIE MAKERS' SUPPLIES?
Call **"DETROIT"**

The wartime growth of our business is due not only to the general increase in metal-working activity but also to our genuine desire to serve the best interests of every customer, and help solve their production problems. We invite your inquiries regarding standard and special die sets, all steel and semi-steel, dowel pins, cap screws, die springs and other accessories.

DETROIT DIE SET CORPORATION
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TOLEDO	GA 5706	BUFFALO	PA 9206

DETROIT
DIE SETS ★

Presenting **REYNOLDS** *New* **POLISHING UNIT**

Illustrated here is standard Motor Driven Bench Model.

Moderately Priced.

Showing Chuck Attachment.

Reynolds New Polishing Unit offers the following outstanding features to users—

- 1" Collet capacity with 1" hollow spindle clear through.
- Uses any standard motor (not a special built-in motor).
- Has 4-step V-Belt drive.
- Speed range
  with 1725 RPM motor – 1725-900-750-600 RPM
  with 1200 RPM motor – 1200-750-600-450 RPM
  with 3450 RPM motor – 3450-1800-1500-1200 RPM
  (Note: You can purchase machine less motor and use any ½ H. P. motor available in your shop)
- Single lever control, starts–stops–applies brake, opens and closes collet. (Note: spindle may be stopped to inspect work without disturbing setting of piece held in collet.)
- Collets #5C Rivett: a popular size which many plants already have. This same Collet is used on South Bend 16" and 10" lathes.
- Has threaded nose spindle for use of 5" 3 jaw chuck (supplied as an extra).
- Ball bearing spindle assembly.

Write, Wire or Phone Reynolds Machinery Company, Providence, R. I., for further details.

REYNOLDS
MACHINERY CO.
211 EDDY STREET PROVIDENCE, R. I.

CHICAGO MOUNTED WHEELS—The first small wheels ever mounted on stationary shanks, they have maintained their supremacy through the years. Over 300 sizes, styles and grains—one to suit every job. They're tough, long lived, dependable.

CHICAGO GRINDING WHEELS—To break production bottlenecks due to the crying need for small wheels, we gave up making all larger sizes for the duration—with full WPB approval—and now specialize on sizes 3" in diameter and under.

America's Unbeatables

Yes, all the wheels in our line are small, but powerful and *swift tools of war* doing their stuff day in and day out — making it possible to speed through everything that requires precision internal or external grinding, polishing and burring — bombsights, planes, tanks, guns, intricate instruments, etc.

PROMPT DELIVERY—Come to America's Headquarters for Small Wheels, custom built to your order. No waiting for shipments now, and after the war a reliable source of supply. Our central location is another asset—cuts shipping time to most plants.

Send the Coupon for Illustrated Catalog

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TEST WHEEL FREE—

So that you will know what Chicago Wheels can do, we'll gladly send one without charge. Tell us material you want to grind and size wheel you'd like.

• *Half a century of specialization has established our reputation as the Small Wheel People of the Abrasive Industry.*

Send catalog. Interested in ☐ Mounted Wheels ☐ Grinding Wheels ☐ Send Test Wheel. Size.....

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AMERICAN BANTAM CAR COMPANY
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BLACKHAWK MANUFACTURING COMPANY
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BUCK X-OGRAPH COMPANY
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CANDLER-HILL CORPORATION
Plant No. 1
Detroit, Michigan

THE CLEVELAND PLANER COMPANY
Cleveland, Ohio

DEVLIEG MACHINE COMPANY
Ferndale, Michigan

DIAMOND WIRE & CABLE COMPANY
Chicago Heights, Illinois

ELECTRONIC ENTERPRISES, INCORPORATED
Newark, New Jersey

FLINT MANUFACTURERS SERVICE
Flint, Michigan

THE FOUR WHEEL DRIVE AUTO COMPANY
Clintonville, Wisconsin

GARDNER MACHINE COMPANY
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GEORGE K. GARRETT COMPANY, INCORPORATED
Philadelphia, Pennsylvania

B. F. GOODRICH COMPANY
American Anode, Incorporated
Akron, Ohio

THE B. F. GOODRICH COMPANY
Oaks, Pennsylvania

GRAY STAMPING & MANUFACTURING COMPANY
Piano, Illinois

HART-CARTER COMPANY
War Production Plant
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HOLTZER-CABOT ELECTRIC COMPANY
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Libertyville, Illinois

HEWITT RUBBER CORPORATION
Buffalo Plant
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INTERNATIONAL MINERALS & CHEMICAL CORPORATION
Magnesium Division
Austin, Texas

THE KEN TOOL MANUFACTURING COMPANY
Akron, Ohio

KOEHRING COMPANY
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MILWAUKEE FLUSH VALVE COMPANY
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PERFECTION GEAR COMPANY
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POSEY MANUFACTURING COMPANY
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Elmhurst, Long Island, New York

TARRANT MANUFACTURING COMPANY
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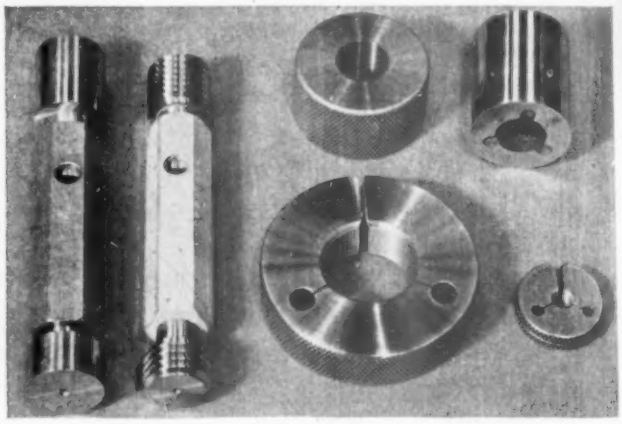
UNIVERSAL BLANK COMPANY, INCORPORATED
Southbridge, Massachusetts

WESTERN-NEWELL MANUFACTURING COMPANY
Freeport, Illinois

Prompt Shipment

of **MERZ**

PLUG AND RING GAGES...



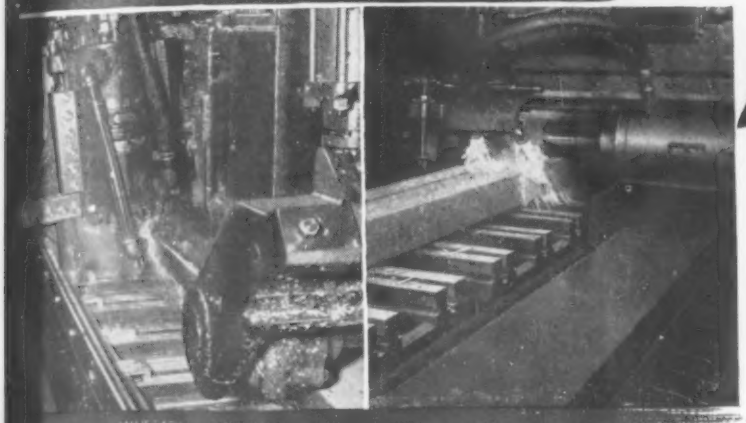
● Merz standard, plain and threaded, plug and ring gages are manufactured under ideal conditions for extreme accuracy. They are made by skilled craftsmen, in a plant that was built and equipped for the exacting requirements of this industry. There are none better on the market, anywhere, and prices are competitive.

This company offers a complete engineering and tooling service. Standard gages are shipped promptly from stock; special gages and tools are designed and made to order; precision products and parts are manufactured on contract. Write for illustrated literature, "4 Spheres of Service To American Industry," just off the press.

MERZ *Engineering Company*

INDIANAPOLIS 7, INDIANA

Sixty Feet of High Speed Millin



Automatic Horizontal... Vertical and Variable Angle Twist Milling

Contour milling cuts are taken in both horizontal and vertical planes. Illustrated is one of the vertical cutter head assemblies. Under template control, this head tilts off-vertical to any required angle up to 15°, toward either the front or back of the machine. Thus the twist or varying bevel cuts needed on most aircraft spar beams are quickly and accurately milled.

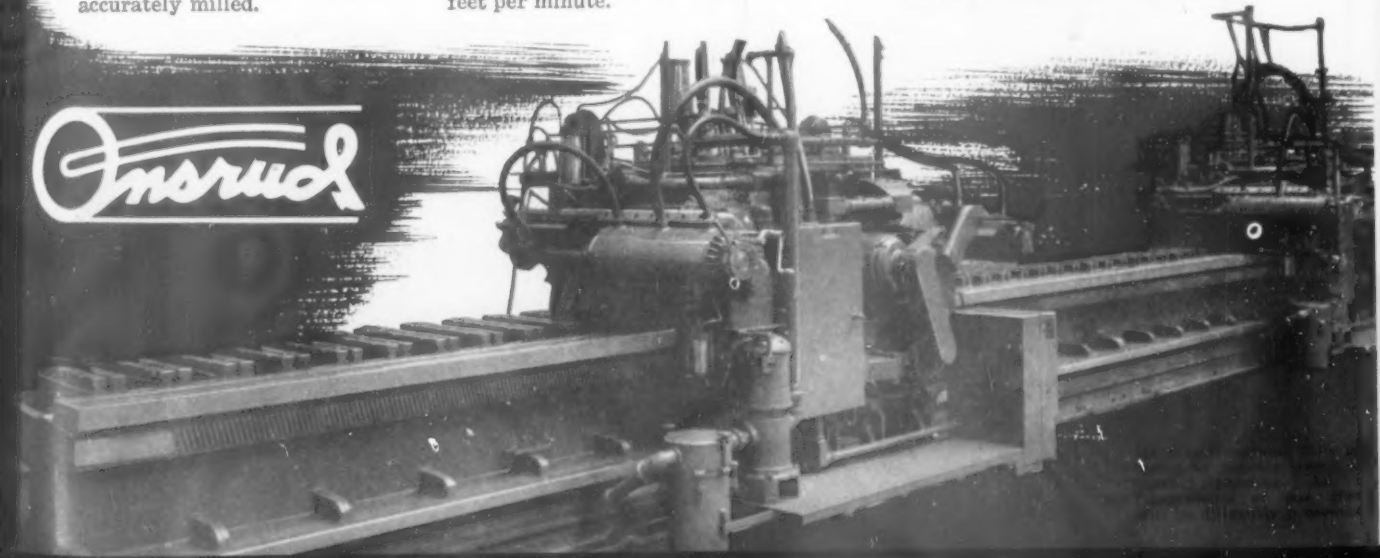
Eight Cutter Heads For 360 HP Total!

The two carriages house eight cutter motor assemblies . . . four 3,600 RPM, 30 HP horizontal type, and four 10,800 RPM, 15 HP vertical type. All heads may be used simultaneously. Due to a special water cooling system, motors are capable of a 100% overload when work requires, developing a total of 360 HP. Lineal velocities of cutters in operation range up to 9,000 feet per minute.

The biggest Automatic Contour Milling Machine ever built, for milling faster than ever before, the huge wing channel spars for America's fighting aircraft. With two carriages under automatic G. E. Thymotrol feed control and eight cutter motor assemblies under automatic template control, the production capacity of this newest Onsrud A80-A is something you almost have to see to believe. Designed for milling aircraft aluminum alloy extrusions or forged billets, this A80-A incorporates all the features of standard Onsrud automatic contour milling machines. Information on request.

ONSRUD MACHINE WORKS, INC.
3927 Palmer Street, Chicago 47, Illinois
Sales Offices in all Principal Cities

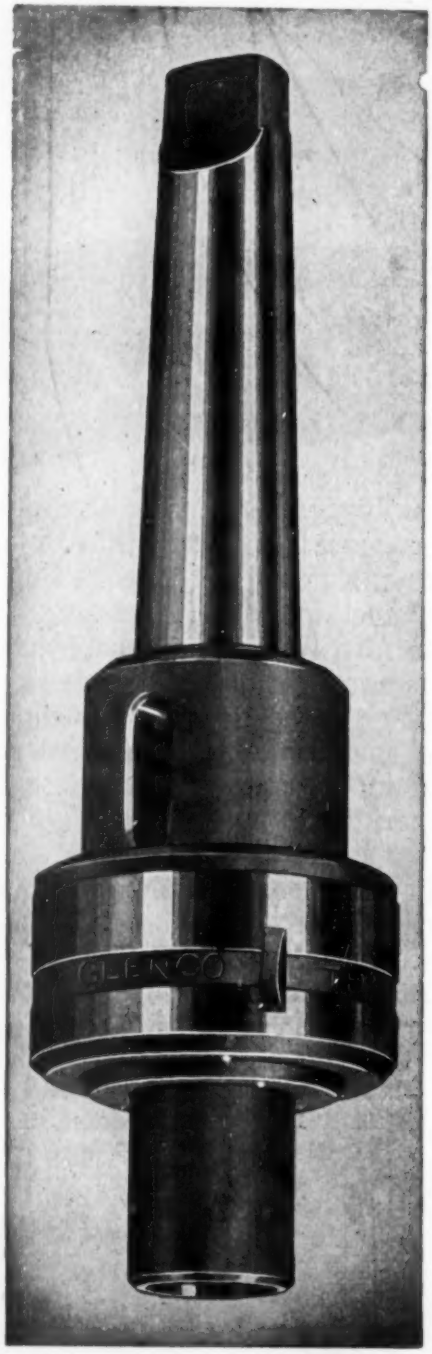
Onsrud



GLENCO

FLOATING TOOLHOLDER

Corrects Machine Tool Misalignment By Producing TRUE and ACCURATE Holes

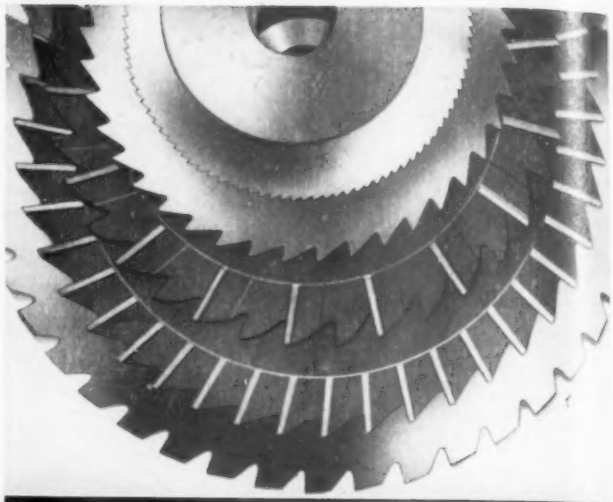


Also Manufacturers of

FLOATING HOLDERS
SPOTFACERS
COUNTERSINKS
REAMERS
COUNTERBORERS
LIVE CENTERS
SLEEVES
TAP CHUCKS
DRILL CHUCKS
ADJUSTABLE ADAPTERS
ADJUSTABLE EXTENSION ASSEMBLIES
QUICK CHANGE CHUCKS
EXTENSION SOCKETS
SPACING COLLARS
ARBORS
END MILLS
WOODRUFF CUTTERS
CORE DRILLS

THE J. C. GLENZER CO.

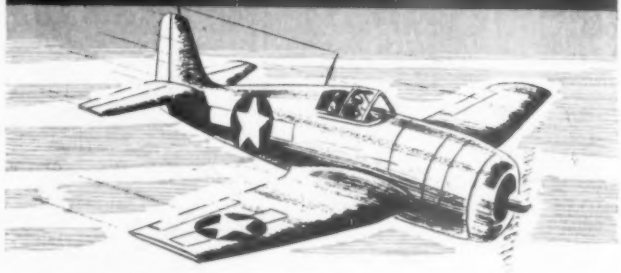
DETROIT MICHIGAN



CIRCLE R Metal Cutting Saws

BUILT BY
PERFECTIONISTS
FOR
Exacting Operations

The Famous GRUMMAN HELLCAT



Circle R Saws and Grumman Hellcat fighters have this in common; both are made by perfectionists to accomplish today's difficult and exacting tasks.

R

CIRCULAR TOOL CO., Inc.

PROVIDENCE 5, R. I.

CHICAGO · PHILADELPHIA · NEW YORK · DAYTON · CLEVELAND
LOS ANGELES · ROCHESTER · INDIANAPOLIS · DETROIT · ST. LOUIS

USED for cold-nosing 90M/M shells, this die made of Timken Graph-Tung Steel produced 180,000 separate headaches for the Axis before it was removed from the press.

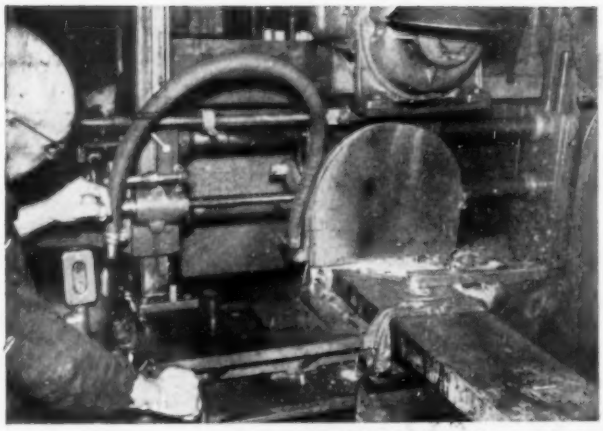
Dies formerly used on this job and made of other steels were able to produce only 15,000 to 40,000 shells before they were scrapped.

This isn't a special case. Succeeding dies on this same job provided similar results. It's typical of the job Graph-Tung is doing for other manufacturers who require a water-hardening steel for bar and tube cold drawing dies, deep drawing dies, bushings, air hammer pistons, general purpose dies and tools.

Use Graph-Tung today when every minute saved brings Victory that much closer. Use Graph-Tung tomorrow in your peace time plans. It means increased production - - increased profits. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

Write on your business letterhead for your new copy of the 8th revised and enlarged edition of the illustrated 48 page booklet of Graphitic Steel.

TIMKEN
TRADE MARK REG. U. S. PAT. OFF.
ALLOY STEELS



No. 302 Campbell Abrasive Cutting Machine cutting 18/8 Stainless Steel forging blanks from slab 2⅝" x 10" x 14'

Campbell DOES ANOTHER PRODUCTION CUTTING JOB THAT "COULDN'T BE DONE"

● The job placed in the lap of a nationally known manufacturer of drop forgings made it necessary to cut 18/8 Stainless forging blanks from flat stock 2⅝" x 10" x 14'—cut-off lengths 9¾".

Without a **CAMPBELL**, cuts took so long that it was impossible to maintain production.

Now a **CAMPBELL No. 302 ABRASIVE CUTTING MACHINE** makes those cuts in 10 minutes—finished, burr-free cuts to dimension, without waste.

If you write the Campbell Engineering Department, they will develop production procedure and costs for you, too, without any obligation.

State materials, shapes and sizes you are cutting. Give lengths of stock, lengths of cut-off pieces and production rate required.

The data worked up for you will be based on actual experience. Remember **CAMPBELL** manufactures the only complete range of abrasive cutting machines—8 types and 19 models—and these machines are currently cutting all grades of steel, annealed and unannealed, non-ferrous alloys, plastics, glass and ceramics. Solid bars, tubular and flat stock.

Campbell

ABRASIVE CUTTING MACHINES

ALSO MANUFACTURERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT

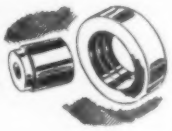
ACCO

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

Facts you should know ABOUT TODAY'S CHROMIUM PLATING

CHANCES are you have an over-all picture of the many virtues of chromium plating . . . its extreme hardness, resistance to chemical attack, unusual surface properties, etc., etc.

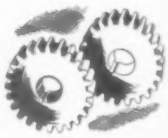
But very possibly you do not know all the ways in which these properties are being utilized in the war effort. The facts here must be extremely brief, but complete information on each application is available both to our present licensees and to any interested manufacturer. Having pioneered in the chromium plating field, United Chromium makes available the results of years of research and development — covering all the possible uses for electro-deposited chromium.



INCREASING OUTPUT OF METAL-WORKING TOOLS

Chromium increases the life of many tools, reduces stoppages and speeds output, as in the case of drawing and forming dies. Chromium plated drills cut more holes between sharpenings. On burnishing bars, chromium steps up production, produces a finer finish. These and other tools are salvaged by rebuilding with chromium.

SALVAGING PARTS AND PRODUCTION WORK



By chromium plating parts machined off-size, many plants are reclaiming rejects — saving the metal as well as man-hours represented in each piece. Successful applications include: — cylinders, pistons, axles, drive shafts, valves, ball and roller bearing parts, and many types of taps, dies, jigs, fixtures and gauges.

REDUCING WEAR ON CYLINDERS AND RINGS

Where cylinders, piston rings and other parts of internal combustion engines subjected to wear, can utilize an oil-retaining finish — chromium plating having the proper degree and depth of porosity results in greatly improved performance. Large quantities of such parts are now being processed by our licensees.

PROTECTING PRECISION OF EQUIPMENT PARTS

Where dimensional accuracy is essential to precision work, many manufacturers apply a deposit of chromium on such parts as: — feed screws, shafts, cylinders, pivots, cams, landing gear struts, etc. Chromium combines extreme hardness with a low coefficient of friction which reduces wear and prevents scoring.

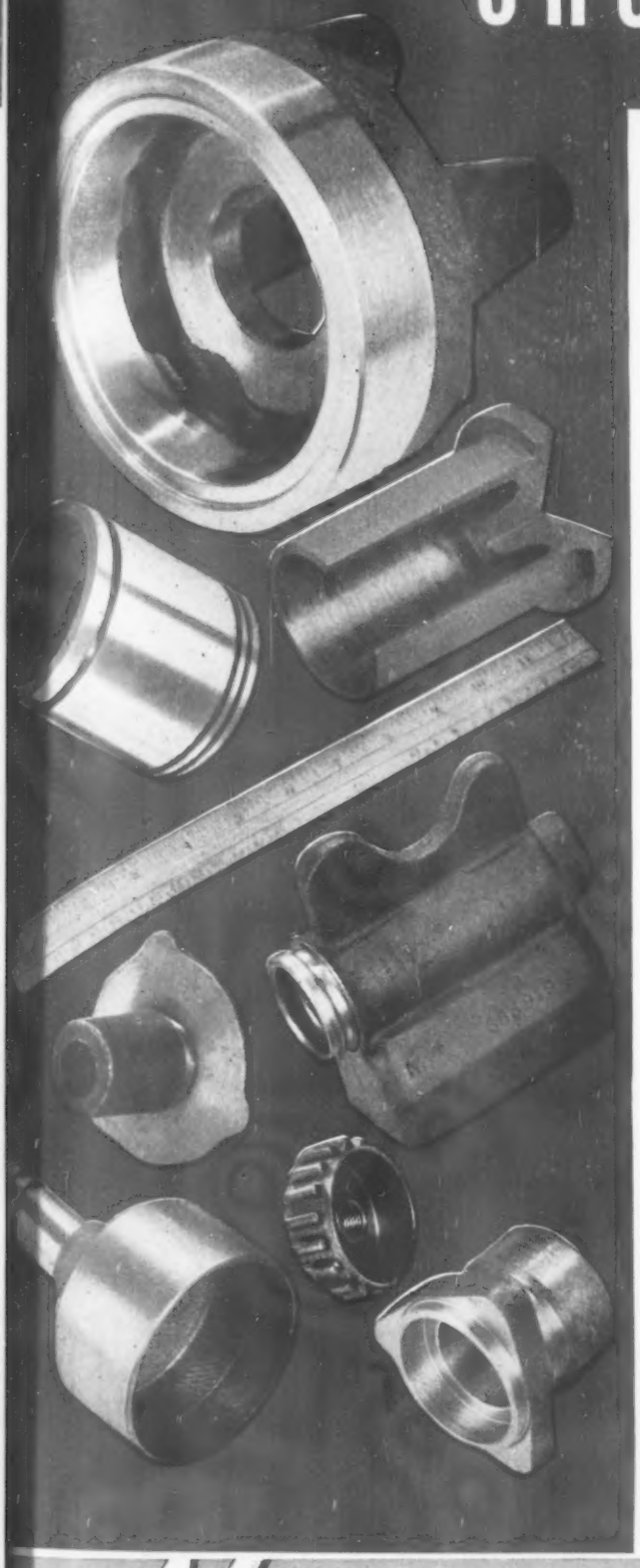
U. C. TECHNICAL ADVICE ASSISTS LICENSEES TO:

1. **Obtain installations properly designed for specific requirements.**
2. **Put installations into prompt production.**
3. **Meet strictest specifications.**
4. **Conserve metals and materials.**
5. **Utilize manpower more efficiently.**
6. **Reduce waste due to rejects.**
7. **Lower over-all plating costs.**

IF YOU have any questions about chromium plating in connection with your work, please write us, outlining your problem. Also send for our helpful booklet "The Last Thousandth of an Inch" containing further suggestions on how chromium plating can be used.

UNITED CHROMIUM
INCORPORATED
51 East 42nd Street, New York 17, N. Y.
Waterbury, Conn. ☆ Detroit, Mich.

How to Reduce Costs on CHUCKING WORK



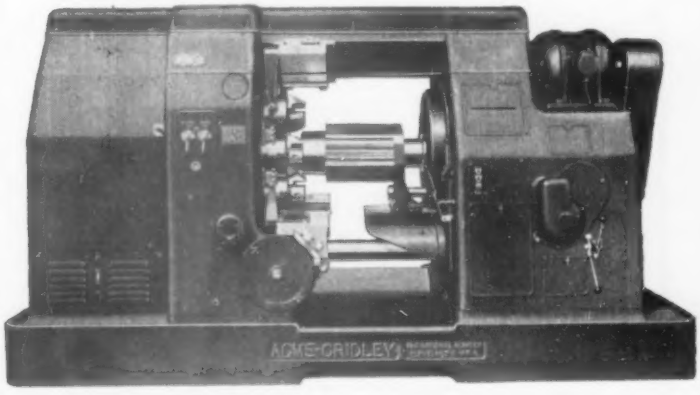
Turning pre-formed parts the "long way" is too slow and too costly. To meet modern mass production conditions, National Acme now offers to industry a new line of 4, 6 and 8-Spindle Chuckers.

These new machines operate with the same high speeds, the same precision, and have the same broad adaptability that have made Acme-Gridley multiple spindle bar automatics such important war production tools.

New! **ACME-GRIDLEY 4, 6 and 8-SPINDLE STANDARD UNIVERSAL CHUCKER with Adjustable Hydraulic Control**

The new machines have extreme flexibility of tooling and adaptability to a wide variety of work. Their accuracy meets the latest war-born standards. They have the precision that comes only from proper weight distribution, rigidity and balance, with freedom from vibration.

Our Engineering Department will gladly consult with you to select the proper type and size to handle your work. Orders are now being booked for near-future delivery. New Catalog CM-43 gives complete details.



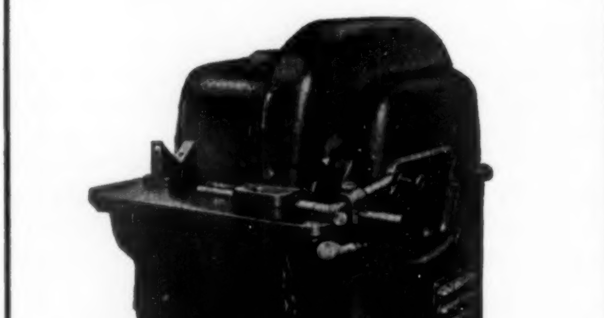
← **New Acme-Gridley Chuckers are engineered for new production and accuracy records—to produce more at lower costs.**

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

DeWALT
METAL CUTTING MACHINES



This compact, sturdily constructed High Speed Cutting Machine for light metals (Model ME-1), will cut ferrous and non-ferrous bar stock up to 1½"; light wall steel tubing up to 4" (Heavier wall tubing in non-ferrous); flat bar stock up to 1" x 4" (ferrous and non-ferrous); and extruded or small structural shapes up to 4" on a side.

Other DeWalts are:

- Foundry Metal Cutting Machine
- Tube Cutting Machine
- Wet and Dry Cutting Machine (ME-2)
- Heavy Duty Wet Cutting Machine (ME-3)
- Dual Column Metal Cutting Machine

DeWalt Builds a Complete Line of Metal Cutting Machines.

Write for descriptive literature

DeWALT PRODUCTS CORPORATION
Lancaster • Penna.

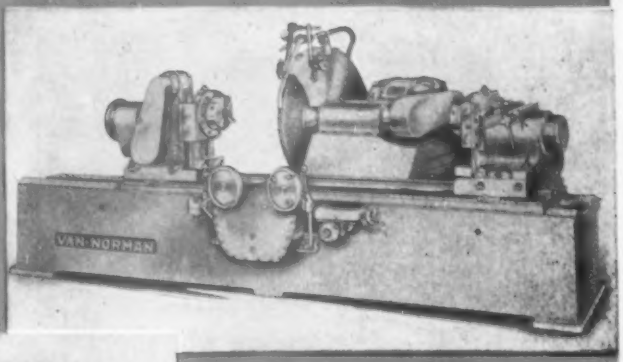
STA-KOOL
TOOL HOLDER

What makes a really fine tool? Proper design and construction, of course, as well as quality of material and workmanship, plus the maker's integrity. JKS Diamond Tools are designed to meet all production problems, but it frequently happens that special conditions call for special treatment. In such cases we make a study of these conditions, preparing a JKS Diamond Tool that will stand up to the most exacting tests. You may add our experience and facilities to your organization by telephoning our nearest district office. This will bring prompt response and wholehearted coöperation.

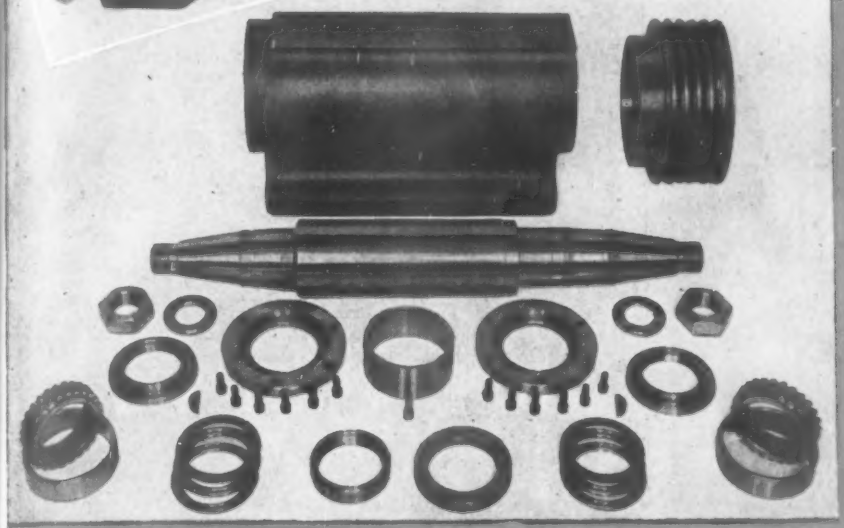
J. K. SMIT & SONS
157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.

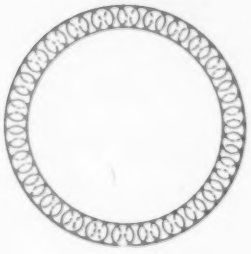
Ⓚ

The POPE-SKF precision spindle as used in the Van-Norman Crankshaft Re-grinding machine



The new Van-Norman Crankshaft Re-grinder





This diagram shows the exact number of rollers used in the SKF bearings to provide the amazingly complete support of this spindle

This POPE-SKF Precision Crankshaft Re-grinder Spindle

is a complete self-contained spindle unit. It produces unsurpassed grinding finishes, operates at low temperature and requires no attention for lubrication or adjustment.

Crankshaft bearings require a high finish. This demands *rigid radial* and *axial* support of the spindle.

Two individual precision thrust bearings prevent axial movement.

The two SKF double row cylindrical roller bearings are individually and definitely preloaded to the exact radial fit required to assure fine ground finishes and long life.

The rugged ability of cylindrical roller bearings has been long recognized but prior to the development of this SKF bearing it has not been possible to mount such bearings with the proper and necessary radial preload.

With Pope-SKF Spindles all you have to do is snap the switch, go to work and grind —no warming up period is necessary.

This spindle, like all other grinder spindles designed and built by Pope craftsmen, is worthy of its place at the very heart of a machine of extreme usefulness and value to the war effort.

Write for new Bulletin E describing various types of Pope Grinder Spindles.

REG. U. S. PAT. OFF.

POPE MACHINERY CORPORATION

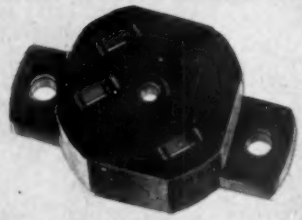
ESTABLISHED IN 1920

261 RIVER STREET, HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION GRINDER SPINDLES

FOR DRILLING or TAPPING

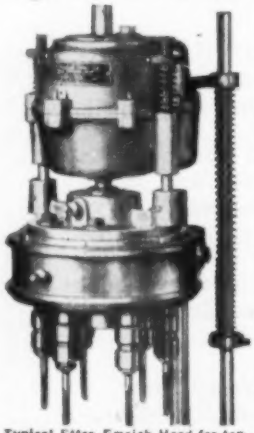
simple parts like this . . .



or complicated ones like this

THE Ettco-Emrick SYSTEM OF MULTIPLE SPINDLE HEADS

will give you highest possible production



Typical Ettco-Emrick Head for tapping 6 holes simultaneously. Quill Clamp, supplied with each Head, assures the rigidity needed for high precision work. Same gear case assembly can be used for drilling the holes.

It will do this because the first thing Ettco-Emrick engineers do when they get your drawing or sample of a part, is to figure out the handling and feeding method that lets you drill or tap all required holes ***simultaneously*** in one or more of the parts.

Then the Ettco-Emrick High Speed Multiple Head needed to carry out the method is made up entirely of standard stock parts.

Finally, a drawing is made of the fixture you need to set up and feed the parts for the drilling or tapping. This drawing goes to you with the Head, or we will build the fixture to order.

Get full details of this system that has solved scores of drilling and tapping problems for many manufacturers. Write today for ***BULLETIN No. 3.***

ETTCO TOOL CO.

586 Johnson Ave., Brooklyn 6, N. Y.

Detroit • Chicago

25 YEARS SPECIALIZATION IN DRILLING AND TAPPING

SUPER-CUT

MAKES SUPER-CUT DIAMOND WHEELS

Faster — Smoother Cutting — Longer Lasting!

--and here's why!

A cross section of Super-Cut Diamond wheels shows layer upon layer of diamonds—each individual diamond solidly bonded in a special metal alloy.

In operation, as the diamonds slowly wear down, the alloy is abraded away, thereby bringing "new" diamonds to the cutting surface. And this ***without*** glazing, assuring a sharp, fast-cutting surface throughout the amazingly long life of Super-Cut wheels!

Only Industrial Abrasives, Inc. employs the closely-guarded secret process by which Super-Cut Diamond Wheels are bonded. That is why Super-Cut wheels cut faster, last longer and materially reduce grinding costs whenever and wherever used!

Industrial Abrasives INC.

3724 W. 38th Street, Dept. 1-B, Chicago 32, Ill.

2 HIGHER PRODUCTION RATES

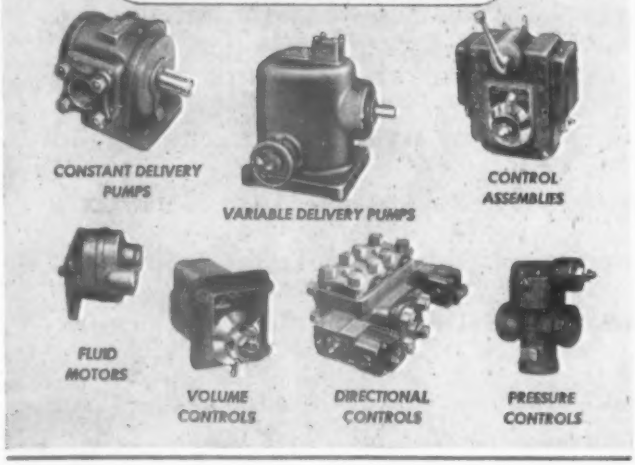
In the postwar period the manufacturer will face two demands that are difficult to reconcile: (1) his customers will want products of highest possible quality at lowest possible cost, and (2) labor will exert every effort to maintain highest hourly wage rates. Without higher machine production rates, such demands are obviously impossible. Inevitably the manufacturer must have machines which will produce more and better products with fewer man hours and machine hours per unit.

Vickers Hydromotive Controls are solving this problem for machinery builders in many industries. For example, completely automatic operating cycles are easily obtainable with Vickers Hydraulic Equipment... much of the required skill can be built into the machine. Flexibility in hydraulic control systems frequently permits time saving by traverse and return at higher speeds. Overload protection can be positive and automatic. Controls are simple and easily operated; they can be so interlocked that neither the work nor the machine can be damaged by the inexperienced or careless operator.

Vickers Application Engineers will be glad to discuss with you the higher production rates and the many other advantages of Vickers Hydromotive Controls.

What will Users Want in POSTWAR MACHINERY?

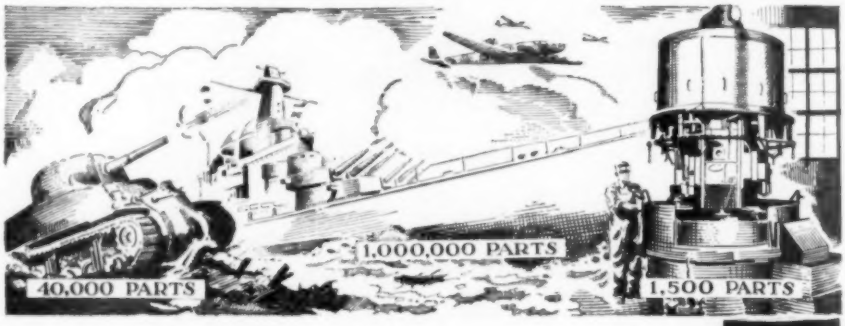
Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



VICKERS
Incorporated
1416 OAKMAN BLVD.
DETROIT 32, MICHIGAN

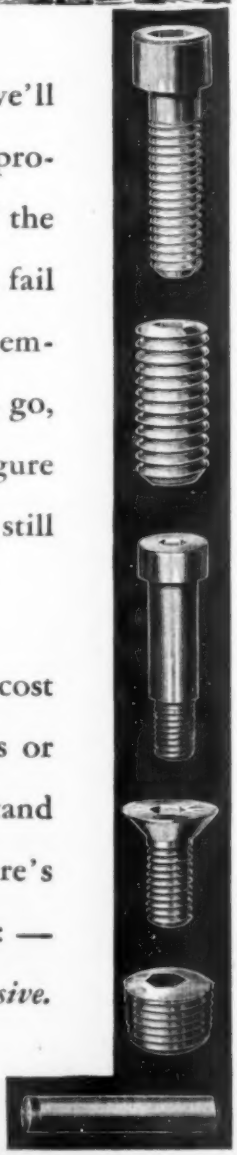
Application Engineering Offices:
CHICAGO • CLEVELAND • DETROIT • LOS ANGELES
NEWARK • PHILADELPHIA • ROCKFORD
TULSA • WORCESTER

The part of ALLENS *is to* HOLD *parts . . .*



Until the one-piece machine is built we'll be dealing with *parts.* And the parts of production- and war-machines are made of the strongest suitable materials. These seldom fail in the unit; they commonly fail in the assembly. Something—just one fastening—lets go, and the machine *in toto* quits. Try to figure the cost in a hard-pressed tool-room, or a still more hard-pressed battle line!

ALLEN Hollow Screws might initially cost more than certain other types of screws or fastenings. But by standing more they stand *you* less, — less the cost of failures. There's only one standard of value in fastenings: — the most DEPENDABLE are the *least expensive.*



Order through your local Allen Distributor, to take advantage of his *mass-purchasing agency* for your locality

THE ALLEN MANUFACTURING COMPANY
HARTFORD, ★ ALLEN ★ CONNECTICUT, U.S.A.

Two "Go's" Two "No Go's" in same Gage handle

DUBLIFE REVERSIBLE PLUG GAGES

Diagram of "Go" end. Same reversible construction in "No Go" end.

Originators and exclusive manufacturers of DUBLIFE GAGES and UPPCO Finish

DOUBLE GAGE LIFE
DOUBLE DEPENDABLE PRECISION SERVICE!

When wear is indicated by *either* "Go" or "No Go" plug, it can be reversed in moments — with scarcely an interruption of work —and you have a *brand new* plug. Finished to greatest precision by UPPCO lapping, DUBLIFE insures accuracy to specifications, for the longest life. Plugs firmly and precisely locked by tapered bronze split collet in perfectly balanced hexagonal handle.

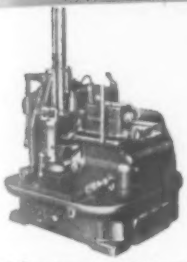
Save critical materials by using DUBLIFE! Send for complete Catalog of United Precision DUBLIFE and many other gages of American Gage design. Wire or write

UNITED PRECISION PRODUCTS COMPANY
3517 W. Belmont Ave., Chicago 18, Illinois

HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS

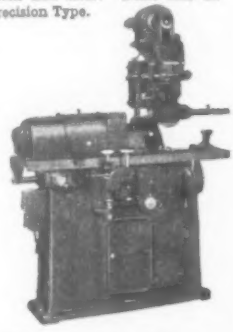
BARBER-COLMAN

REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS

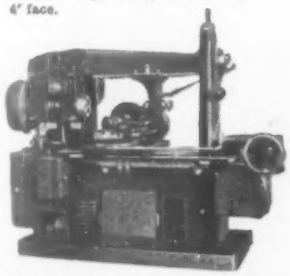


TYPE S Automatic Hobbing Machine — For production of small precision gears up to 1" diameter x ½" face and 200 D.P.

No. 2 Standard Hobbing Machine — Capacity: 5" dia. x 7" face. 12 Pitch and finer. Built also in Precision Type.



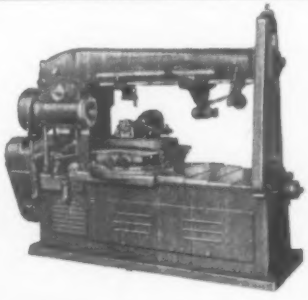
No. 3 Automatic Hob Sharpening Machine for hobs and formed cutters. Capacity up to 4" dia. x 4" face.



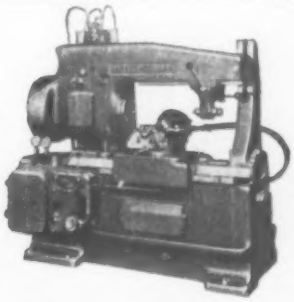
TYPE A Hobbing Machine — A rigid, accurate machine for general purpose or production hobbing. Capacity: 12" dia. x 12" face. 4 Pitch and finer.

. . . "SOMETHING MORE" FOR '44

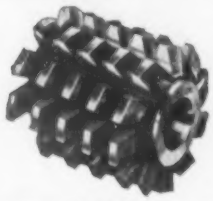
For thirty-five years our Machine and Small Tool Divisions have specialized in the manufacture of high quality production machines, cutting tools, and allied equipment for hobbing, milling, and reaming. The broad experience we have gained in this work has enabled us to solve many difficult problems for our customers. Now . . . as the "something more" which we offer for 1944 . . . we are providing an *extension of our Engineering Service.* By making our experience more easily available to you, we expect to help you in two ways. First, you can be sure you are operating your Barber-Colman machines and cutting tools so as to achieve best possible production and accuracy with longest possible life. Second, you can be sure of a source for sound, practical advice on the many knotty how-shall-we-do-it problems arising from today's demands for greater precision, greater production, or both. Consult Barber-Colman Engineering Service . . . it is ready to serve you even more in '44.



TYPE T Taper Spline Hobbing Machine — May be used also on general hobbing work within its capacity. Spur and spiral gears, straight and involute splines, etc., may be hobbed.



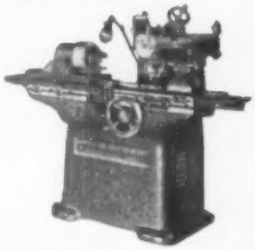
TYPE D Hobbing Machine — A heavy duty high production machine powered hydraulically. Capacity: 14" dia. x 14" face. 3 Pitch and finer.



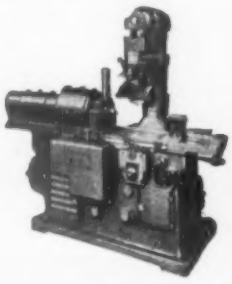
HOBS — Ground and Unground, Standard and Special.

MILLING CUTTERS — "Paraform" Design; Formed, Standard and Special

REAMERS — Fluted, Inserted Blade, and "Pinwedge" Expansible Reamers.



COMBINATION Sharpening Machine — Sharpens hobs, cutters and reamers; straight gashed up to 24" stroke; or maximum 30° helix with 8" stroke.



No. 4 Automatic Hob Sharpening Machine for hobs and formed cutters. Capacity up to 10" dia x 12" face.

Barber-Colman Company

GENERAL OFFICES AND PLANT 105 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

FEDERAL *Taperlock* GAGE HANDLES

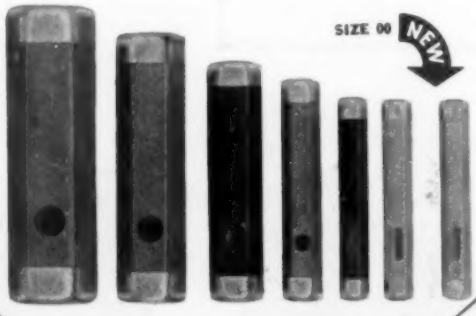
MADE of light weight plastic material, Federal Gage Handles are lighter than any metal used, even one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue in long continued use; an advantage appreciated by women inspectors.

They are highly satisfactory with glass gages being so much lighter than metal handles, they reduce the danger of chipping and breakage.

Insulating properties help prevent transmission of bodily heat to gages which may affect accuracy.

Marking for identification is accomplished with the same marking tools used for metal gages.

Immediate Shipments



FEDERAL TOOL CORPORATION
400 NORTH LEAVITT ST., CHICAGO, ILL.

DOUGLAS *Precision* SLOTTER

Typical production parts machined on the Douglas Slotter.

For Tool Room and Production

A wide range of service is assured by the Douglas Precision Slotter because of its vertical design, swiveling ram head and tool holder. Automatic circular table with independent automatic feeds in all directions gives the machine greater flexibility and a further advantage of easy mounting of work without the need of costly fixtures.

Control levers are conveniently located, permitting quick, smooth operation and better observation of work during operation.

DOUGLAS MACHINERY CO., Inc.
158 BROADWAY - NEW YORK, N. Y.

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JUST OUT! NEW 1944 GEORGE SCHERR Tool Catalog

Belongs in every metal-working plant.
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LIMITED BUDGET
INSPECTION LABORATORY
Made in U.S.A.
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MICROSCOPES
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and other SHOP TOOLS and GAGES.

Here condensed in 48 easy-to-read pages is important information about instruments, tools and gages that you may need in 1944. Send for the NEW Scherr tool catalog now.

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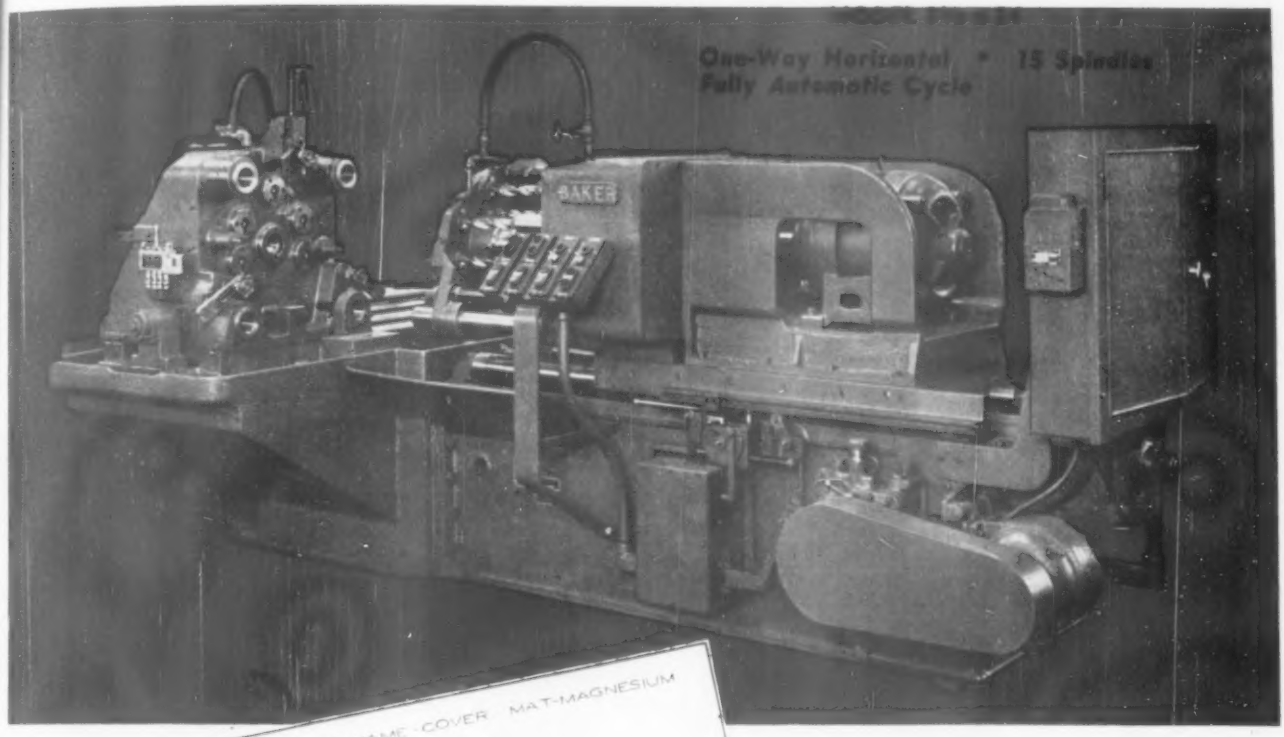

ILLUSTRATION shows the Fixture to front at Chucking Position. The operator loads, unloads, and pushes button to start cycle.

Fixture and work automatically index to 1st (Front) Position (8 spindles) for drill and rough bore.

After this operation, Fixture moves to rear position (7 spindles) for finishing operations. Then, an automatic return to Chucking Station.

Baker Brothers, Inc.
Toledo, 10, Ohio

FOR SINGLE AND MULTIPLE SPINDLE DRILLING MACHINES, VERTICAL AND HORIZONTAL TYPES

BAKER

DoALL

INDUSTRY'S NEW SET OF TOOLS

Write for Literature on above Products to THE DoALL COMPANY, Des Plaines, Ill.

Sales & Service Offices: Baltimore, Boston, Chicago, Cleveland, Denver, Detroit, Erie, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Orlando, Philadelphia, Pittsburgh, Portland, Rochester, Rockford, St. Louis, Salt Lake City, San Francisco, Seattle, Spokane, Toledo, Tulsa, West Hartford.

HERE'S A *Machine-Saver!*

●There's less strain and wear on your machines and machine parts when you use Sutton collets because Sutton's patented Diamond Grip takes horizontal and rotary thrusts at an angle and holds tightly with 10% to 15% less tension.

And, because slippage is reduced to practically zero, you can step up machine cycles to tool capacity—boost production and cut costs while cutting down wear and repairs.

Patented Diamond Grip is self-cleaning—dirt, scale and chips work out automatically—does not clog—*costs no more than ordinary collets.*

See our representative or send for Catalog No. 15

SUTTON TOOL COMPANY
2895 W. Grand Blvd. Detroit 2, Michigan

SUTTON

Diamond Grip

COLLETS

CUTTING THE TOUGHEST JOBS ON EVERY TYPE OF ARMAMENT
SIEWEK-BUILT "PROGRESSIVE"
SHEAR-CUT
END MILLS
● Working hard to help make American armament the best and most powerful in the world, Progressive "Shear-Cut" End Mills are cutting clean, fast and long on the toughest jobs.
That's because they are precision made of the finest materials, to feed accurately, minimize chatter, give adequate chip clearance and uniform cutting action. Rigidly held, these End Mills will permit working to extremely close limits.
Progressive End Mills are now being manufactured by the Siewek Tool Division of Domestic Industries, Inc. . . . the same high character product, the same old family of skilled workers—plus the wider resources of Domestic Industries, Inc. for added manufacturing facilities and improved customer service.
Remember, the name "Progressive" has always and will continue, to signify "superior tools for superior work."
SIEWEK TOOL DIVISION
OF DOMESTIC INDUSTRIES, INC.
DETROIT (FERNDALE STATION) MICHIGAN
Designers and Builders of
JIGS, FIXTURES AND SPECIAL MACHINES
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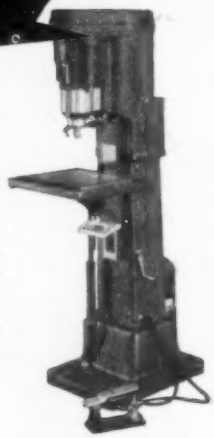
AFFILIATED WITH SIEWEK ENGINEERING DIVISION • CHICAGO • DETROIT • HARTFORD—a nationally known organization staffed with experienced engineers—Consulting, Processing, Designing, Fabricating and Efficiency Methods

THE Right MACHINE
THE Right FIXTURE



Insure continuous, trouble-free tapping production The HASKINS Way, combining Haskins AIR CONTROL with the right fixture. Add Piece Part Control and you approach completely automatic tapping. Placing the part in the fixture actuates a micro-switch—AIR does the rest. Each piece is tapped uniformly, precisely—faster than by any other method. For complete information on high speed tapping The Haskins Way, send for our latest catalog. R. G. Haskins Co., 2756 W. Flournoy St., Chicago, Ill.

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PRECISION TAPPING EQUIPMENT

BOYAR-SCHULTZ
COPPER HEAD LAPS

A practical method for lapping holes accurately and economically. Lapping action is rapid; abrasive compound works into the copper sleeve providing a medium that works with speed.

The only wearing part is the copper sleeve which is quickly replaceable when worn. This assures real economy.

Size is controlled by adjustment feature. Available from stock in sizes 1/8" to 2 1/2". Special diameters on application.

NOTE: A lap consists of an Arbor and Copper Sleeve. When ordering, please be sure to state if complete Laps or Sleeves only are wanted.

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Columbia TOOL STEEL

GOOD—
Columbia is Good Tool Steel always
—and in all ways.

—So Are War Bonds

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE, PRESIDENT
GENERAL OFFICE AND WORKS
520 EAST 14TH. STREET • CHICAGO HEIGHTS, ILL.

AN *All-Electric* ADJUSTABLE-SPEED DRIVE
FOR A-C. CIRCUITS

SPEED RANGES up to 16 to 1 SIZES 1 TO 30 hp.

SPEED CHANGES. Speed adjusted smoothly over a wide range while machine is in operation.

QUICK STOPPING. Obtained electrically from speed adjuster handle or stop button.

SLOW FOR THREADING and INCHING. Safe for setting-up and for close inspection in process.

SMOOTH ACCELERATION. No clutches. Smooth acceleration and deceleration to protect light material in motion.

ALSO: A direct space-saving drive; speed-control convenience without limitations; reversing; start and stop without interfering with speed setting; ample starting torque.

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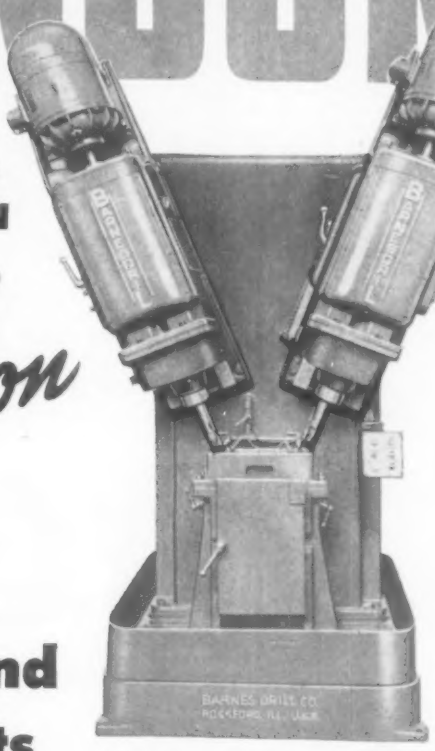
ANNOUNCING

BARNESDRIL *hydraulic production*

Drilling, Reaming and Facing Units



(Above) *Two-Spindle* BARNESDRIL *No. 10 Hydraulic Production Drilling Machine arranged for drilling and counterboring 12 holes in propeller shafts.*

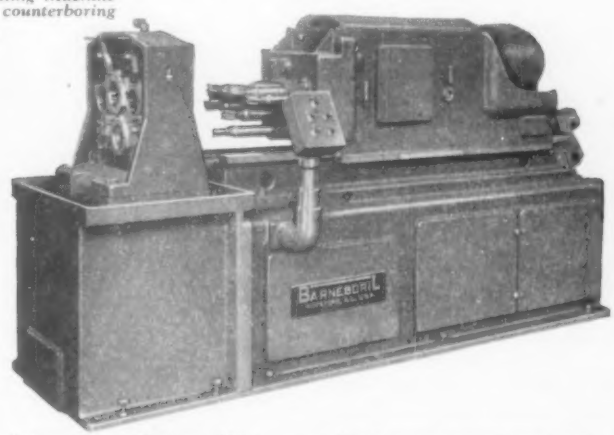
Used in Any Vertical, Angular or Horizontal Position or for Grouping Around Indexing Table... *furnished as complete machine unit for either drilling, boring and facing or tapping operations*

BARNESDRIL, builders of the popular Hydram Hydraulic Drilling Machines and self-oiling, All-Geared Production Drilling and Tapping Machines, has developed these new special Hydraulic Production Drilling Units. Furnished complete with a single motor driving the spindle rotations and hydraulic pump for any required automatic hydraulic feed cycle, these units present a fast, low-cost method for specialized high production drilling, reaming and facing operations—also for boring or for tapping as required.

3 Sizes Available

These new units are regularly available in the following three sizes, motorized according to the requirements of the job:

No. 5 Unit . . . . . with 5 to 7½ hp. Motor.
No. 10 Unit . . . . . with 10 to 15 hp. Motor.
No. 20 Unit . . . . . with 20 to 25 hp. Motor.



(Above) *No. 10 Horizontal Unit arranged with 8-spindle Auxiliary Head for facing and counterboring 8 bosses simultaneously on Airplane Engine Parts.*

How to Adapt These Units to Meet Your "Special" Drilling or Similar Requirements...

The possibilities for developing these units into high-production machines are practically unlimited. They may be used in any one, or combinations of vertical, angular, or horizontal positions, and are ideally suitable for grouping around a hydraulic indexing table for progressive operations. Each unit has a Flange Support for mounting interchangeable Auxiliary Heads of any desired number and arrangement of spindles.

These units can be furnished suitably mounted on the proper columns, horizontal beds, supports, hydraulic indexing tables, and other elements as a complete machine in itself. These units can also be easily and economically converted from one arrangement to another to meet future requirements.

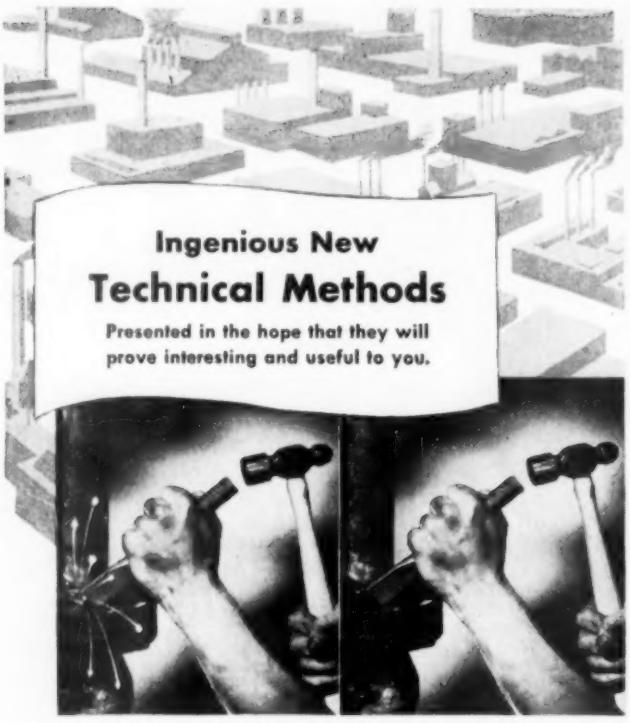
Let BARNESDRIL engineers show you how to adapt these new Hydraulic Drilling Units to your work. There is no obligation.

Get Complete Facts on These New Units

Send today for complete details and specifications of these new Drilling Units. Find out how these Units can be adapted to your work.

Barnes Drill Co.

848-71 CHESTNUT STREET
ROCKFORD ILLINOIS, U.S.A.

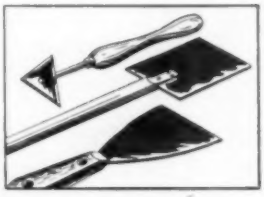


Beryllium Copper Bites Into Steel

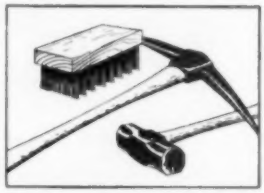
It is an old saying that when a dog bites a man it is not news, but when a man bites a dog it is news. That being the case, it is certainly news when copper bites into steel. Copper is, of course, one of the softer metals but when 2 percent beryllium is added to copper, its characteristics are changed. The alloy is heat treatable which explains the remarkable strength and hardness. Hit a chisel made of Beryllium Copper with a hammer and it will bite into steel without dulling the edge. Tools made of Beryllium Copper are non-sparking and therefore are used in ordnance plants, oil refineries and other places where explosions may occur from sparks off steel tools. Tensile strength as high as 200,000 lbs. psi can be obtained with Beryllium Copper; hence, it is used for many applications where resistance to high loading and impact fatigue are important, such as airplane motor bushings. Most of the critical springs and diaphragms used in aviation, Navy and Signal Corps instruments are made of Beryllium Copper because of its reliability as a spring material.

We hope this has proved interesting and useful to you just as Wrigley's Spearmint Gum is proving useful to millions of people working everywhere for victory.

You can get complete information about these tools from the Beryllium Corporation, Reading, Pennsylvania.



Man has tried for ages to rediscover the art of hardening copper. Today this can be done by adding to copper a small percentage of beryllium.



Not only does it produce an alloy harder than tempered steel, but one that does not produce sparks, an essential when working near highly combustible materials.

X-65

New! Hammond WET TOOL GRINDERS
FOR CARBIDE AND HIGH SPEED, TOO

LOOK! Hammond's NEW 10" and 14"
Provide many improvements over previous models: cup wheel safety discs — free flowing, fully adjustable coolant spouts — and splash pans. Under all conditions No spray-No splash grinding is assured.
"You're dry when you grind wet!"

Hammond Machinery Builders INC.
KALAMAZOO 54, MICHIGAN

WRITE FOR BULLETIN 204

1636 DOUGLAS AVENUE
Eastern Branch: 71 West 23rd St., New York 10, N. Y.

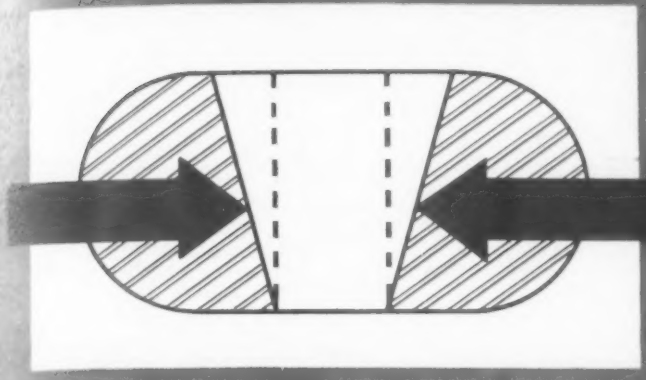
Producto MODERN MACHINE Vises

There are no Vises that compare with PRODUCTO Vises.
These superior and modern Vises are so much better than the conventional design. Bodies fitted with hardened and ground wearing plates — extra large opening between jaws—large screw and nut for movable jaw — make these 4½" and 6" Vises practically indestructible and useful for very long wear.
We also make Cam Lock Vises in 4", 5" and 7" sizes for production milling and drilling operations. Best vise for this purpose.
Don't bother with old tools — use Modern Machine Vises.
Ask for 8-page circular—
Also manufacturers of Producto Die Sets and Die Makers' Accessories.

PRODUCTO

The PRODUCTO MACHINE COMPANY
940 HOUSATONIC AVE. BRIDGEPORT, CONN.
3017 MEDBURY, DETROIT, MICH.

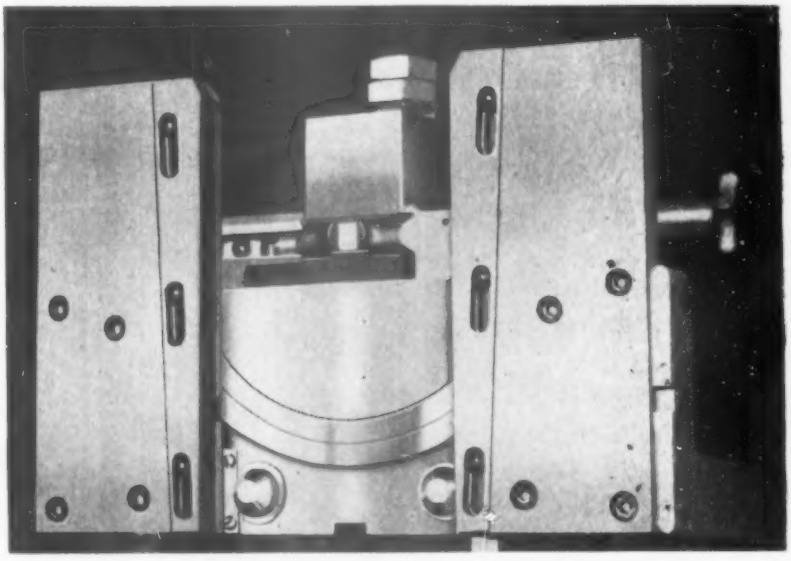
Two NON-PARALLEL SURFACES Broached USING THIS One FIXTURE



ANOTHER EXAMPLE OF HOW DETROIT BROACH ENGINEERS DEVELOP NEW APPLICATIONS IN BROACHING

The fixture shown here was designed and built by Detroit Broach Company to provide the necessary rigidity and at the same time provide a means for turning the part several degrees. Thus it is possible to broach non-parallel surfaces in one stroke of the ram.

It is work of this kind that has made Detroit Broach Company famous throughout the country for doing things with broaches that others have called impossible. Broaching can increase speed . . . improve accuracy . . . in many manufacturing operations. Broaching will solve many of *your* production problems. Write Detroit Broach Company today.



ARMY NAVY

DETROIT BROACH COMPANY

20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

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CINCINNATI
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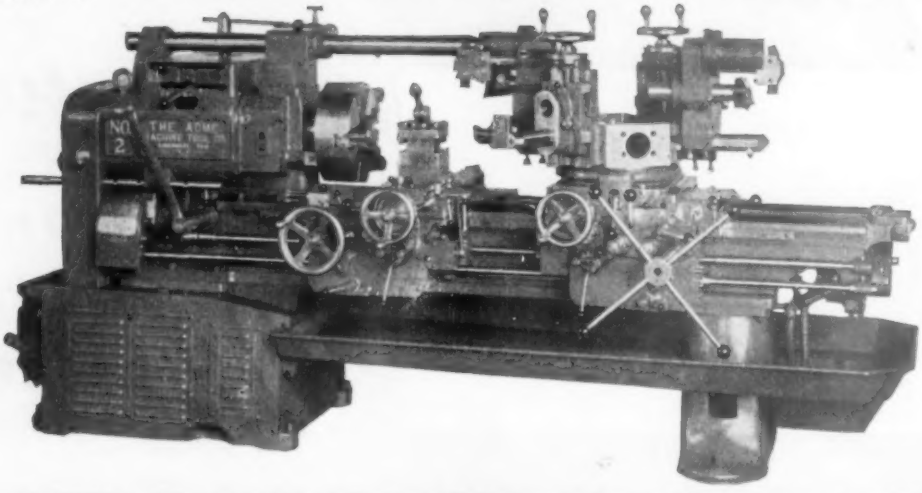
UNIVERSAL
TURRET LATHES

SPEED PRODUCTION--SAVE TIME



GREATER RIGIDITY AND ACCURACY UNDER HEAVIER CUTS AT FASTER SPEEDS!

The above illustrated No. 2 ACME Universal Turret Lathe with its stationary overhead pilot bar and headstock brackets together with rigid turret tooling permits heavy multiple cuts. These features assure accuracy while faster speeds are possible through the use of cemented carbide cutting tools. This machine features heavy duty multiple turning heads and vertical side tools and heavy duty reversible cutter holders. Also shown is the lead screw type chasing attachment with split nut brackets and threading dials on both carriages. • WRITE FOR COMPLETE DETAILS.

THE ACME MACHINE TOOL CO. 4955 SPRING GROVE AVE., CINCINNATI 32, OHIO

THE IMPROVED NIELSEN LIVE CENTERS

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Load capacity
200 to 40,000 lbs.
at 100 rpm

Have adjustment
to take up wear
and
preload bearings

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Standard Morse
Taper No. 2 to 6
in stock

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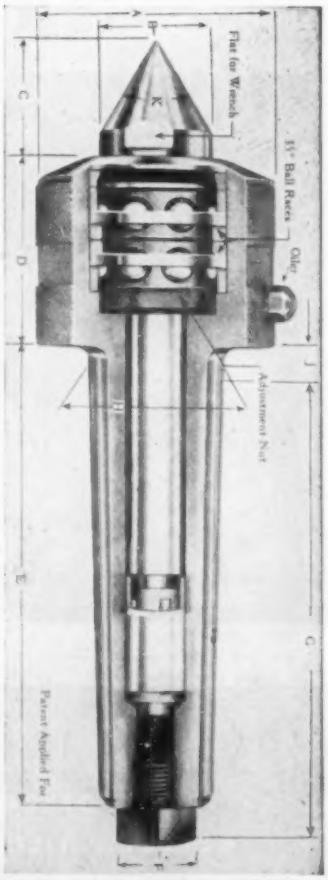

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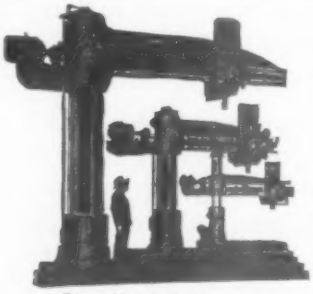

"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL FEATURES—

1—LOW HUNG DRIVE TO THE SPINDLE
2—ALL POWER DRIVEN PARTS RUNNING IN OIL
3—QUIET RUNNING AT ALL SPEEDS
4—CONCENTRATED AND CONVENIENT CONTROLS
5—CONSTRUCTED ON UNIT PRINCIPLE

THE
CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U.S.A.

PLAN-O-MILLING

"FIRSTS" WITH PLAN-O-MILL

- 1st to install General Electric's remarkable new Thy-mo-trol electronic feed control!
- 1st planetary to mill external threads with standard multiple thread cutter!
- 1st planetary to coordinate feeds and speeds!
- 1st to provide absolute control of feed-in!

FAST, ACCURATE MILLING OF CYLINDRICAL FORMS

You get the speed and high production of special purpose equipment when you replace wasteful, obsolete machines with Plan-O-Mill.

Yet Plan-O-Mill is flexible. A slight tooling change adapts it to a wide variety of thread milling and form milling jobs.

Plan-O-Mill saves manpower too! It is semi-automatic, can be operated by semi-skilled or unskilled labor. One man or woman can operate two or more Plan-O-Mills.

Find out about Plan-O-Mill today! Contact your machinery supplier or write direct.

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CORPORATION
1511 East Eight Mile Road · Hazel Park, Michigan

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1871 CLYBOURN AVENUE

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Free TRIAL IMMEDIATELY

on ZAGAR COLLET FIXTURES

The Production-Increasing Tools for milling, drilling, tapping, slotting and like operations

Distributors Wanted

Simplicity of operation, accuracy, rugged construction and simple design assure greater and more accurate production by less experienced operators. We will ship to any reputable concern on a free 30-day trial. "No convince, no pay." Fair enough? Order today.

Zagar Holding Chucks come in 1" and 2" sizes.

Zagar Indexing Chucks come in 1" and 2" sizes.

Get Bulletin E-1

ZAGAR TOOL, INC.

23880 Lakeland Blvd. Cleveland, Ohio

BETTER HARDENING— BETTER RESULTS

We can make your tools do more work, and last longer, too. We have U. S. Army and U. S. Navy Aircraft Approval for heat treating, obtained after rigid tests and careful check-up by Army and Navy personnel.

Perfection's skilful work is helping manufacturers in 31 states . . . 26 years specializing in treating tools, dies, molds, and "fussy" mechanical parts. We treat tons of tools—in wide variety. Many require the use of 5 or 6 furnaces to get just the right result. When ordinary methods do not suffice, we have new ones: Deepfreezing, Nusite, and Silverfinish.

Tell us your problems. We have the equipment, skill, and experience to solve them quickly and economically.

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DEEPFREEZING — The ideal way to quick-age parts, stabilize gauges, and get rid of retained austenite.

NUSITE — Produces higher hardness (65 to 67 Rockwell C) throughout high speed cutting tools—and still they are almost twice as tough.

SILVER FINISH—Bright hardening . . . up to 1900 dg. F. No scale or discoloration. Polished pieces retain their shine. Saves grinding. Fine for engraved dies, threaded parts, die casting, and inserts.

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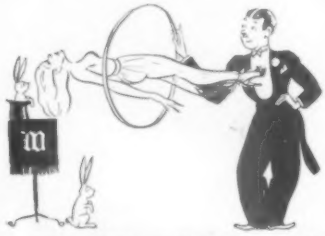
It's No Trick At All With TORIT



TORIT DUST COLLECTORS

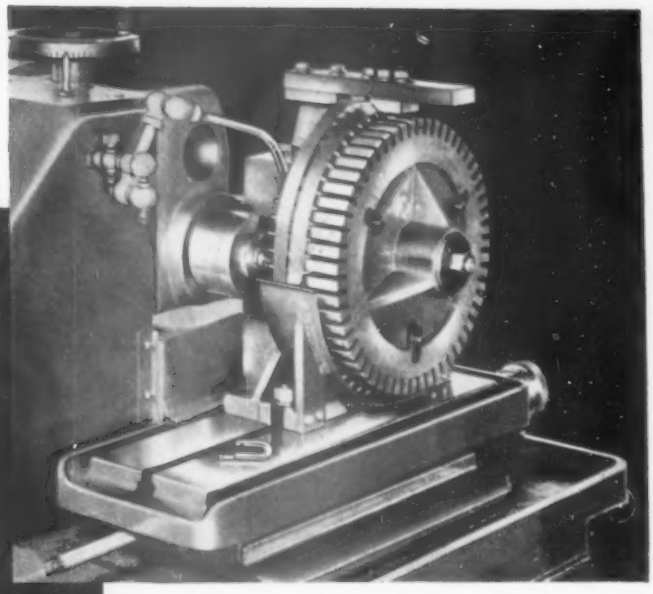
make the collecting of abrasive dust particles a simple matter. Portable and completely self-contained they are easily attached to existing machinery and, when necessary, they can be moved about to fit into new production layouts.

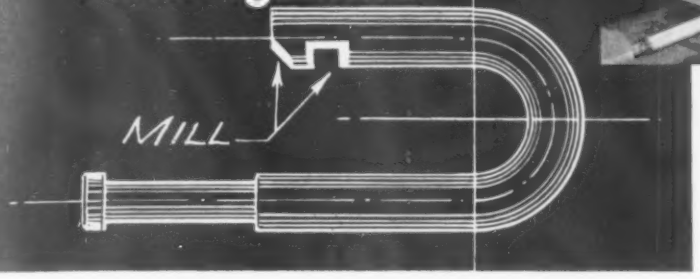
Torit Dust Collectors trap grinding dusts at their source and the cleaned air is re-circulated into the room . . . saving employes' health, valuable machinery and reducing heating bills. For complete information write:

TORIT MANUFACTURING COMPANY
281 Walnut St.
St. Paul 2 Minn.

TORIT
Dust Collectors
SELF-CONTAINED UNITS

Milling with no lost loading time





. . . on the U.S.MULTI MILLER

Illustrated (above) is the U. S. Multi-Miller equipped with a Continuous Automatic Rotating Fixture of the Ferris Wheel type for the milling of lock shackles shown in detail above. The notch and bevel cuts, indicated by heavy lines in the drawing, are completed at the same time—the operator merely loads the Rotating Fixture at one side and removes the finished parts from the other side. With this setup, the table of the U. S. Multi-Miller remains stationary and the rotation of the Fixture feeds the pieces to be milled to the cutter . . . the operation is continuous, with no lost time for loading.

The U. S. Multi-Miller can also be equipped with Slotting Attachments, Automatic Indexing Fixtures, Vertical Head, Hand Indexing Table, Continuous Milling Fixtures, Automatic Cut-off Units and other time-saving attachments.

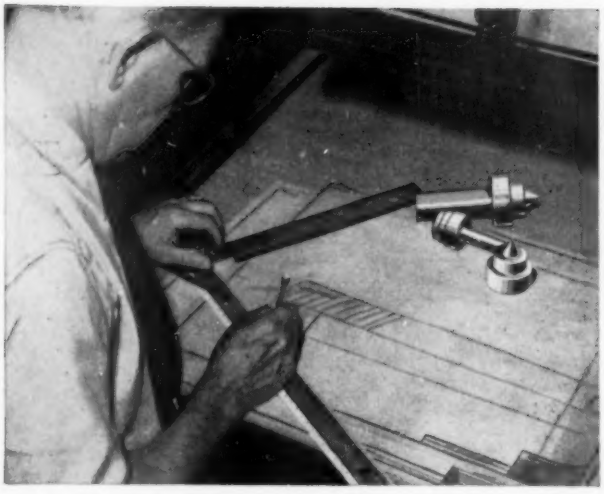
Bulletin No. 60T contains complete descriptive literature, helpful illustrations and specifications for the U. S. Multi-Miller and its various time-saving applications—send for your copy.

THE U. S. TOOL COMPANY, INC., Ampere (East Orange), N. J.

Builders of U. S. Multi-Millers, U. S. Multi-Slides, U. S. Automatic Press Room Equipment, U. S. Die Sets and Accessories

Another Application of the Continuous Automatic Rotating Fixture

This drawing shows another part which is speedily milled as indicated on the U. S. Multi-Miller equipped with the Ferris Wheel type of Rotating Fixture. Possibly the operations on similar work in your plant can be improved (costs reduced and production increased) by the application of U. S. Multi-Miller Equipment. Write for recommendations.



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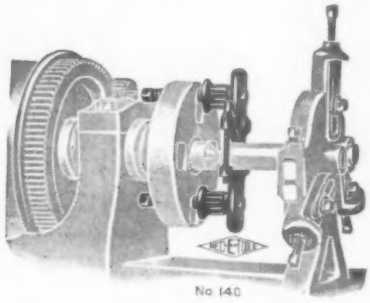

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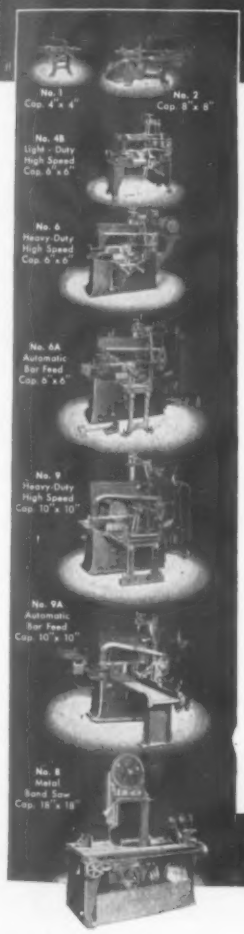

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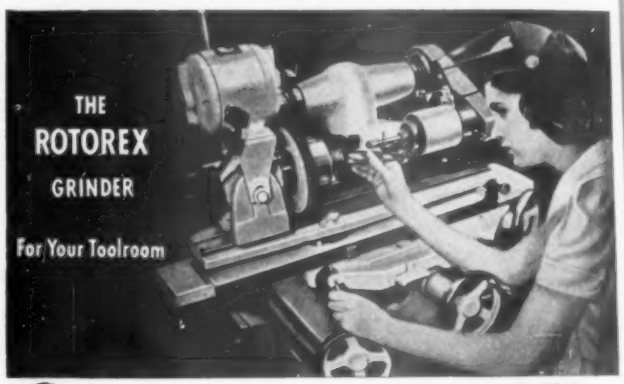

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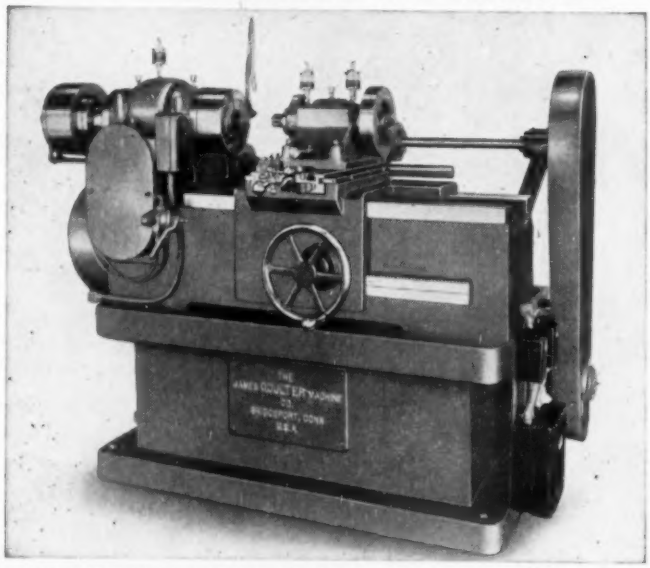

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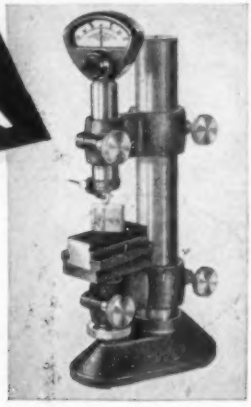

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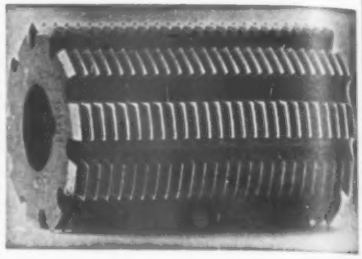

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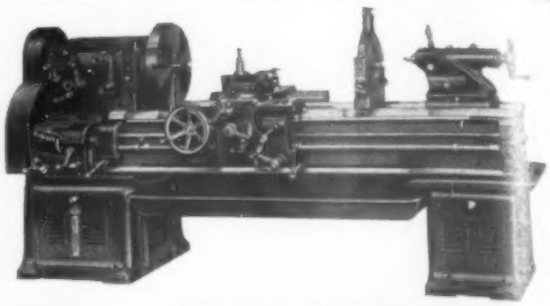

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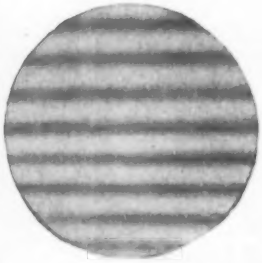

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What's a tough spot for a toolmaker?

It could be an error in machining that would immobilize a sorely needed tool.

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For just such an impasse, let Hartford Chrome come to the rescue!

It's a matter of teamwork between toolmaker and plater. Hartford Chrome speeds production every day by correcting errors — salvaging rejected parts — rebuilding old ones.

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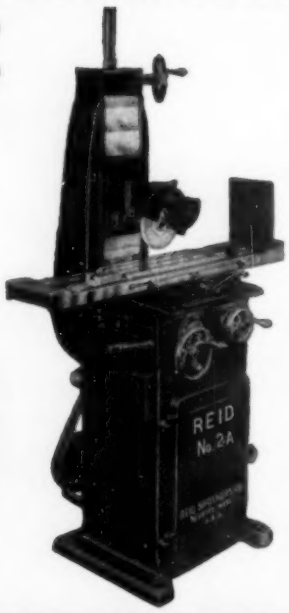

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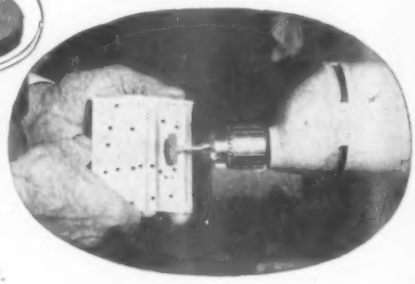

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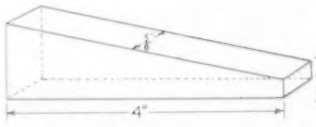
ORIGINATORS AND MANUFACTURERS OF HELICAL FLUTED TAPER PIN REAMERS

THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.

WEBBER ANGLE GAGE BLOCKS

SPECIFICATIONS



Furnished in sets of 14 blocks in 3 Series as follows:—

1st Series—Degrees—1—3—9—15—30—45

2nd Series—Minutes—1—3—9—27

3rd Series—Seconds—1—3—9—27

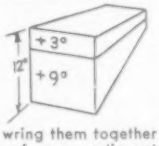
A complete set of WEBBER Angle Gage Blocks will yield any angle from 0° to 103° — a total of 370,800 angles—in steps of 1 second of an arc. Working surfaces are optically flat—blocks wring together and adhere same as regular gage blocks.

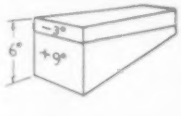
Every set includes a parallel and knife edge.

HOW THEY ARE USED

Webber Angle Gage Blocks are used for precision measurement of angles in the laboratory, inspection room, shop, etc. To obtain a desired angle, blocks are selected from the set which when added—***or subtracted***—will yield that angle. These blocks are wrung together and will adhere just as with gage blocks.

Example: To obtain an angle of 12° — take the 3° and 9° blocks and wring them together with the large ends marked "plus" adjacent. Thus, 3° plus 9° equals 12°. To obtain an angle of 6° take the same two blocks (3° and 9°) but wring them together with the "minus" end of one adjacent to the "plus" end of the other. Thus, 9° minus 3° equals 6°.





Very little study is required to comprehend how 2 or more Angle Gage Blocks may be wrung together to produce any angle in degrees. The blocks in minutes and seconds are combined in the same manner and added on.

In the minute and second series only 4 blocks are needed which will combine to form up to 30 minutes. If 32 minutes is required—simply add to the original measurement one more **degree** (60 minutes). Then subtract 28 minutes from this—leaving 32 minutes which was required.

No mathematical computation is involved in using WEBBER Angle Gage Blocks. With each set is furnished a table showing which blocks to use and how to combine them to get any angle required. Precision angle measurement is reduced to an extremely simple, fast, sure operation.

Absolute accuracy is assured since proof of the accuracy of the blocks is contained within the blocks themselves. This is true of gage blocks for linear measurement. Example—wring together any number of gage blocks to make a size equal to that of a single block. Then the group of blocks will check perfectly with the single block. By this principle—if the largest block in the set is correct then all the other blocks in combination checking with it must also be correct.

This principle applies in checking WEBBER Angle Gage Blocks inasmuch as the starting place is a straight line (instead of the largest block in the set as above) and a straight line can easily be checked by optical means.

WEBBER Angle Gage Blocks are guaranteed accurate to within $\frac{1}{5,184,000}$ part of a circle. Such accuracy, obviously, cannot be checked with the usual shop tools any more than regular gage blocks can be checked with a micrometer.

A limited number of sets of WEBBER Angle Gage Blocks are now available. Literature and prices furnished on request.

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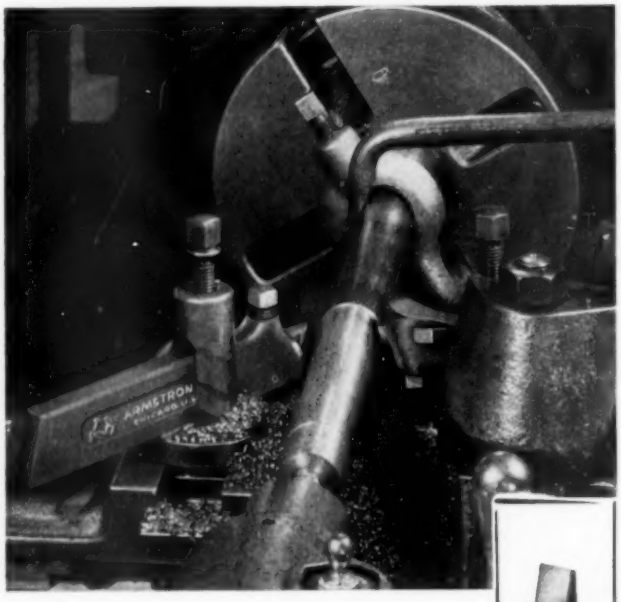
ARMSTRONG
Carbide TOOL HOLDERS



Standard Shape Armide Cutters

Armide (Carbide Tipped) Cutters and ARMSTRONG **Carbide** TOOL HOLDERS can increase your output on long-runs and tough or hard steels. They increase the interval between tool re-grindings from 20 to 50 times. They cut the toughest and hardest steels easily.

Armide Cutters come in 5 standard cutting shapes—"A" Right-hand Turning, "B" Left-hand Turning, "C" Square Nose, "D" Round Nose (for general turning and facing), and "E" 60° Threading. 10 sizes.

ARMSTRONG **Carbide** TOOL HOLDERS, come with "Straight", "R. H. Off-set" or "L.H. Off-set" Shanks. They hold cutters at 180° (proper for carbide) provide extended, close-up support to the cutting edge, and are extremely rigid.

Write for "Carbide" Circular.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
360 N. Francisco Ave., Chicago 12, U.S.A.
Eastern Warehouse & Sales:
199 Lafayette St., New York

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Die & Tool Makers
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In Precision Grinding
one of the essentials to success is
GILMORE DIAMOND TOOLS

CIRCULAR ON REQUEST

F. F. GILMORE & CO. 285 COLUMBUS AVE. BOSTON 16, MASS.

Cross section of Tru-Grip Tap Holder showing positive drive to tap.

TAPPING *24 hours a day ...6days a week!*

. . . and producing accurate work. That is a report from one plant where four Procunier Tapping Heads have been operating continuously for over a year. Thousands of shops report similar experiences because, these remarkable heads are built to stand under the toughest production grind. The exclusive advanced design of the new Procunier Tapping Heads assures you accurate tapping at high speeds with automatic protection for taps! Tap is driven by a double-cone, cork-faced friction clutch which automatically regulates tap driving power by pressure applied through the drill press spindle. Operators can quickly detect full or loaded taps by the "feel", or pressure on the clutch, required to drive them thus avoiding needless tap breakage. With this sensitive Procunier smooth operating friction clutch, bottom tapping is as simple as through tapping, since the clutch instantly slips should the tap strike bottom or stick due to tap loading.

Send for Bulletin

giving full details, description and prices on complete line of Procunier Precision Tapping Heads to meet all needs. The new Tru-Grip Tap Holder—and also the full line of Procunier Universal Tapping Machines.

PROCUNIER SAFETY CHUCK CO.

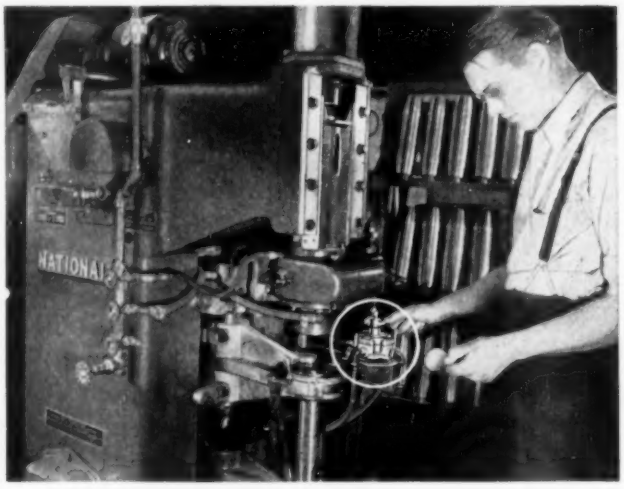
12-18 S. Clinton St., Chicago 3, Ill.

Send me bulletins on: ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holders ☐ Universal Tapping Machines.

Name .....

Address .....

Hanna *Control* Valves



Mean GREATER Efficiency

Quick, positive acting Hanna Control Valves will increase the efficiency of air or hydraulic actuated machines and equipment which you build or use in your plant. Their rugged construction and modern, fatigueless design insure long, trouble-free life.

Hanna Unitite Valves are designed so that disc and seat wear uniformly across their full diameters, maintaining perfect surfaces and permanent tightness. Also important, renewal can be made without removing valve body, or disturbing pipe connections.

Hanna Valves may be used with air, oil or water . . . as straight-way, 3 or 4-way valves . . . at pressures up to 250 lbs. They are available in three mounting styles.

Send for your copy of the new Hanna Valve Bulletin. It's just off the press . . . gives full data.

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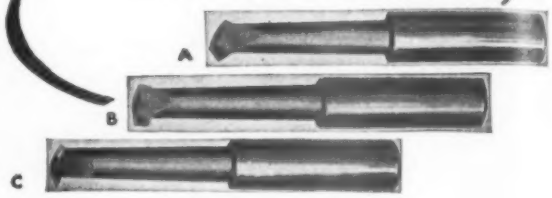
1765 ELSTON AVENUE • CHICAGO 47, ILLINOIS
AIR & HYDRAULIC CYLINDERS • RIVETERS • AIR HOISTS

For efficient performance on high production



(a) For Internal Boring
(b) Facing and Bottoming
(c) Internal Threading

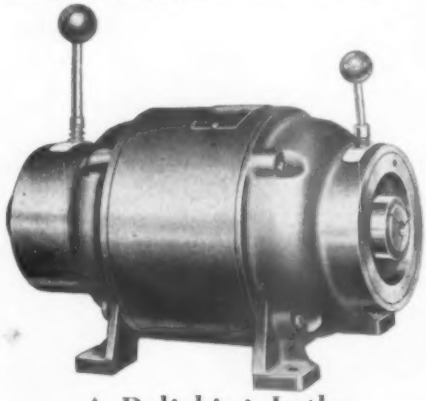
Made in wide range of sizes. (The small sizes shown above. The larger sizes come with cutting heads screwed securely to high-tempered shanks of special alloy.) Style A Boring Tool will outlast six normally-forged tools. Style B particularly suitable for use on turret lathes and automatics. Especially adaptable for recessing. Style C has advantage of cutting cleanly a wide range of different threads in smallest borings imaginable. Also available with carbide tips.

Ask for Catalog A-1139 for Super High Speed Tools and for A-398 for Carbide Tipped

BOKUM TOOL CO.
14775 WILDEMERE AVE. • DETROIT 21, MICH.

Here Is Another Unsurpassed Machine Tool from Crozier Craftsmen

Crozier, the first manufacturer of turret tool posts for bench lathes, has always expanded its line with foresight. Industry's needs are thoroughly analyzed before Crozier-craftsmen build a tool to fill them—then they construct a product that is unsurpassed in its field.



A Polishing Lathe

A hollow spindle adapts this lathe to high volume production for either long or short pieces. All tool marks are removed and a beautiful finish results. Full ball bearing and available in 14 models for collets or chucks.

Bed Turrets • Collets • Collet Attachments
Surface Plates • Polishing Lathes • Turret Tool Posts

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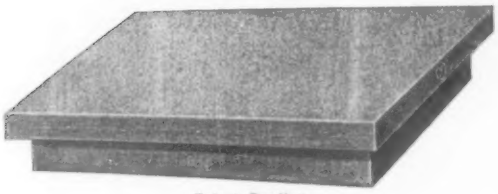
Crozier

Crozier Machine Tool Company • Hawthorne, California
Successors to C-W-C Corporation

Herman
PRECISION GRANITE
Surface Plates



Patent Pending

Distinctly New . . .
Definitely Superior .

Herman PRECISION GRANITE Surface Plates eliminate once and for all the disadvantages and uncertainties of old-fashioned metal surface plates. Cut from solid granite, they cannot warp and will remain accurate to 1/10,000 inch overall. Practically non-porous, they do not become charged with tool damaging abrasive particles. Corrosion and rust-proof, they are as nearly indestructible as man and nature can make them. Already scores of shops throughout the country have declared them unequaled for precision work. Let Herman PRECISION GRANITE Surface Plates increase production efficiency and economy in your shop. Write today for full information.

THE HERMAN STONE CO.

1243 LEONHARD ST. DAYTON, OHIO

Standard Sizes and Weights

12" x 18" — 75 lbs.
18" x 24" — 160 lbs.
20" x 30" — 275 lbs.
24" x 36" — 480 lbs.

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PRICES ARE REASONABLE

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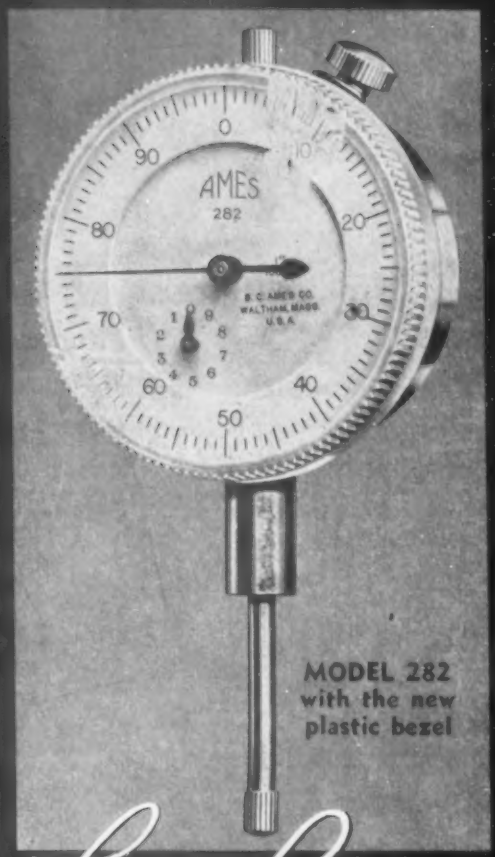

MODEL 282
with the new
plastic bezel

Long Range
DIAL INDICATORS

For greater range when testing long tapers and in extensometer work, Ames Indicators having spindle travels up to one inch are commonly used.

The Plastic Bezel eliminates shadows and relieves eye strain. A new feature exclusive with AMES.

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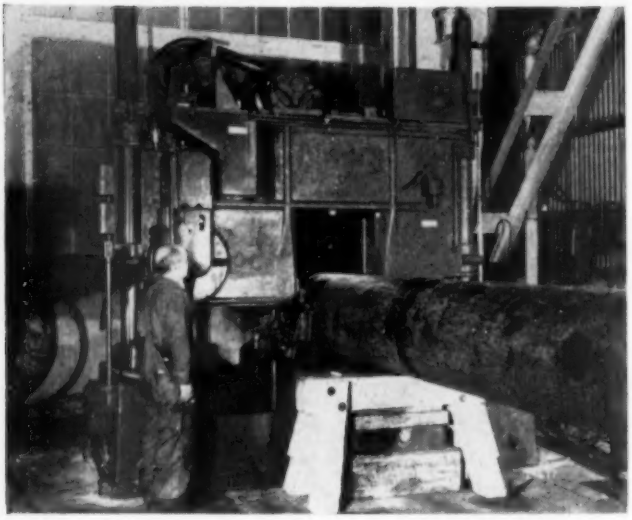
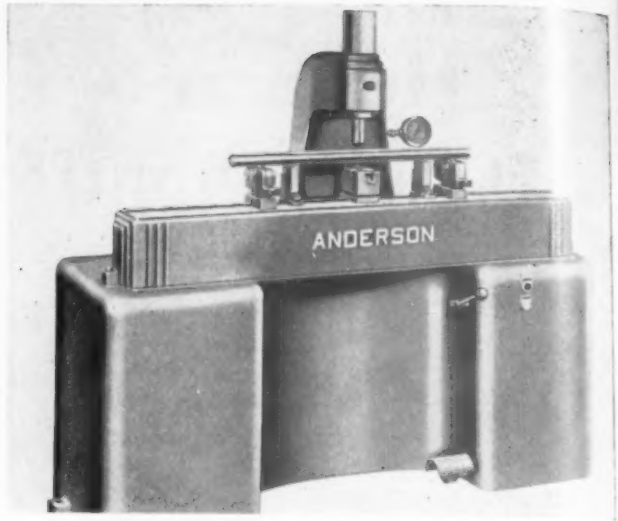
B. C. AMES CO.
WALTHAM, MASS., U. S. A.



Armstrong-Blum Hydraulic Roll Stroke Hack Saw Machine



High Speed Hydraulic Straightening Press

NEW EQUIPMENT

T. M. REG. U. S. PAT. OFF.

• Materials + Processing •

HYDRAULIC HACK SAW (M53)

Developed to meet the needs for a saw to cut off or trim large billets, blocks, and forgings quickly and accurately, a new Universal hydraulic roll-stroke hack saw machine has been developed by Armstrong-Blum Mfg. Co.

Said by the manufacturer to be the largest hack-saw built, the machine weighs 16,000 pounds and covers a floor space of 56" x 122" with an extreme height of 151". Normal capacity is 24" x 24" and maximum capacity is 25" x 26".

The company states that the machine retains all the advantages of the hack-sawing method, namely: low initial cost, low tool cost, small chip loss, low power consumption, lower maintenance, and simplicity of operation. The saw, known as the MARVEL No. 24, takes a special blade 26" long, 4½" wide and ⅛" thick, with 2½ teeth per inch. The company reports that operations show the saw has solved the problem of cutting large pieces fast, accurately and economically.

CUTTING LUBRICANT (M54)

A new type water solution cutting lubricant, said by the manufacturer, Filmite Oil Corp., to combine maximum cooling properties with oiliness and high film strength has recently been placed on the market.

Transparent and practically colorless, the lubricant, known as Hydromite, is not an oil but a water solution which cools and lubricates, according to the company. The product dissipates heat much faster, allowing greater cutting speeds and increasing production. Also, its low viscosity allows it to flow to the point of work quickly.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

NEW MACHINE FIXTURE FOR CONTINUOUS MILLING (M55)

Designed for continuous milling to form on bar stock, a new milling fixture has been developed by U. S. Tool Co., Inc.

Adaptable to any standard make milling machine, the unit is self-contained and motor-driven. It is built in any size to meet the buyer's requirements concerning material and size of miller on which the unit is to be used.

The fixture is equipped with power-driven feed-in and take-off rolls to control the movement of bar stock for its entire length through the fixture, eliminating waste. The rolls are grooved to accommodate the particular shape of the bar being machined.

Continuous Milling Fixture

HIGH SPEED HYDRAULIC PRESS (M56)

A new high speed, hydraulic straightening press with a capacity of 10 tons, yet so sensitive that a shaft may be bent as little as .001" has been put on the market by Anderson Brothers Mfg. Co. It is possible, according to the manufacturer, to apply the exact load required to correct shaft run-out.

Four distinct advantages from use of the hydraulic system on the press are cited by the company. These include flexible control by means of a rotary control valve, safe operation by use of a spring return mechanism of the control lever, high rate of production because of rapid ram return speed, and ease of operation provided by complete control of the press by the use of the control lever.

Available attachments include checking rolls, spring loaded centers, adjustable anvils, adjustable stop collar to determine the 6" maximum stroke of the ram, and optional foot control equipment.

PRECISION AIR GAGE (M57)

Principal feature of a new air-gage developed by Pratt & Whitney is that the product being gaged does not come in contact with any mechanical gage point or gaging plug during the gaging operation.

Developed for use in gaging bearings with a surface so delicate that high speed gaging requires an instrument which does not actually touch the inside diameter, the gage gives accurate readings by recording back pressures from the flow of air between orifices of the instrument and the surface being measured.

The air-control cabinet contains a filter unit for removing moisture and

(Continued on page 182)

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Request the information and service you desire and keep your library up-to-date . . .

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For your convenience these three business reply cards enable you to request quickly

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Simply fill out the card, indicating the information or service you desire, and mail.

Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described.

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ANSWERING
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Requesting:
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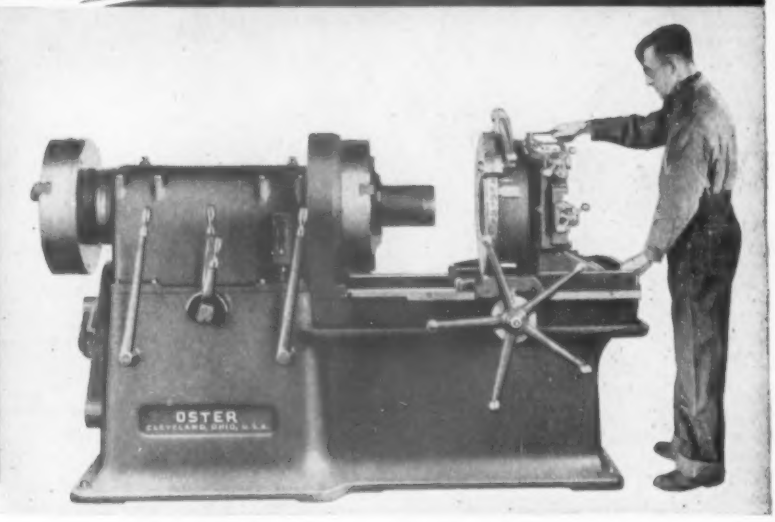
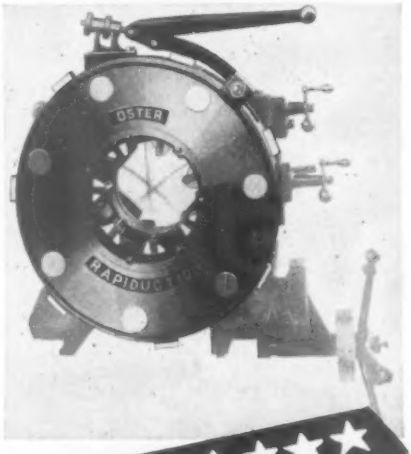
TO CALL

"Rapiduction"

HIGH SPEED PIPE THREADING



(above) "RAPIDUCTION" Die-Head adjusted to thread smallest size within range.
(below) The same "RAPIDUCTION" Die-Head adjusted to thread largest size within range.



Quickly Adjustable, Single Die-Head Threads Complete Range of Each Machine

WITH NEVER A DIE-HEAD CHANGE!

● The "RAPIDUCTION" Die-Head is one of 15 important features of Oster "RAPIDUCTION" high speed, high production power threading machines.

The "RAPIDUCTION" Die-Head with one set of holders covers the entire range of each machine and a single set of high speed steel chasers threads all sizes of American National Pipe Threads where pitch and taper are the same. Any one or more chasers in the set can be replaced without renewing the entire set.

Three Sizes of "RAPIDUCTION" Machines

No. 6-A: Pipe range: 1½" to 6". Bolt range: 1" to 2".
No. 8 : Pipe range: 2½" to 8". Extra range: 1½" & 2".
No. 12 : Pipe range: 3½" to 12". Extra range: 2½" & 3".

Typical "RAPIDUCTION" Speeds

No. 6-A threads 1½" pipe in 11.3 seconds; 3 inch pipe in 25.3 seconds. No. 8 threads 6" pipe in 66 seconds. No. 12 threads 8" pipe in 86.7 seconds; 12 inch pipe in 190 seconds. Other sizes of pipe in range of each machine are threaded at comparable high speeds.

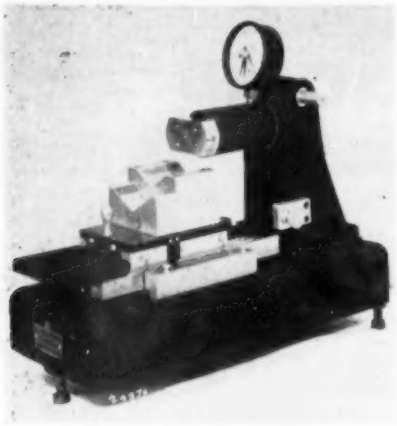
Write for illustrated Catalog No. 43.

OSTER MACHINES
Save Money
to Help You Buy
WAR BONDS

OSTER

THE OSTER MANUFACTURING COMPANY • 2063 E. 61ST St. • Cleveland, O. • U.S.A.

foreign matter from air taken from the shop line. From the filter the air is passed through a pressure reducing



Pratt-Whitney Air Gage

valve where it is stepped down to 30 to 40 lb. per sq. in. for operating the gaging unit.

The filtered and regulated compressed air is fed into the rear of the gage unit from where it is passed into the gage plug containing two orifices. The clearance between each orifice and the adjacent bearing wall is usually 0.003 in. The air gap so created restricts free flow of air from the orifices, and the back pressure is calibrated on the indicator. Out-of-roundness is detected by rotating the bearing, and taper is checked by traversing the carriage.

TRANSPARENT AMMONIA PRINTS

The Frederick Post Co. announces that it will furnish trial quantities of its new transparent ammonia developed prints to 100 users for test purposes.

Object of the offer is to reduce the time ordinarily required between the pilot stage and large scale production of a new product. Users who accept the offer are required to agree to submit a detailed report on results of the test.

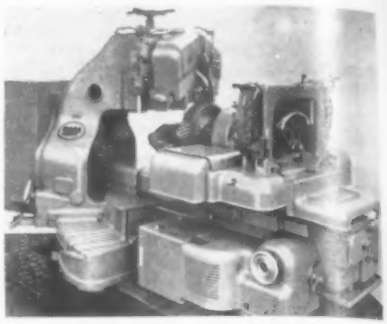
The company announces that its new process has passed months of testing for fading, keeping quality, stability of image and background, printing and developing speed, sharpness of image and ability to pick up both strong and delicate detail. Companies wishing to make the test should write to The Frederick Post Co., Box 803, Chicago, 90, Illinois.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

NEW TYPE GEAR GRINDER ***(M58)***

Outstanding feature of the new HSS-60 Maag Gear Grinding Machine is the fact that all gears are ground by two saucer shaped wheels and no coolant is used, according to the Cosa Corp., U.S. distributors for the Maag Co. of Zurich, Switzerland.



Maag Dry Gear Grinder

The company reports that burned surfaces or hair cracks never will be found on gears ground by the Maag dry grinder. Both spur and helical gears can be ground to an accuracy of .000001". A maximum pitch error of not more than .0002" and profile error of not more than .00012" are said to be possible, and still higher accuracies may be obtained by allowing a little more time for the light finish of the final grinding operation.

Accuracy in profile is constant because the pitch block and steel bands are not subject to wear. Several gears can be ground simultaneously on the arbor. Unskilled operators can take care of a battery of machines.

LIGHT DUTY TAPPING MACHINE ***(M59)***

Increased accuracy is the chief feature of a new line of light duty lead

(Continued on page 184)

NATIONAL Tools CLEVELAND

Hobs
Gear Cutters
Gear Shaper Cutters
Milling Cutters
Reamers
Broaches
Counterbores
Slitting Saws
Circular and Flat Form Tools
Special Tools

National Tools have an International Reputation

Our Purpose

To make accurate tools and permanent friends

ARMY E NAVY

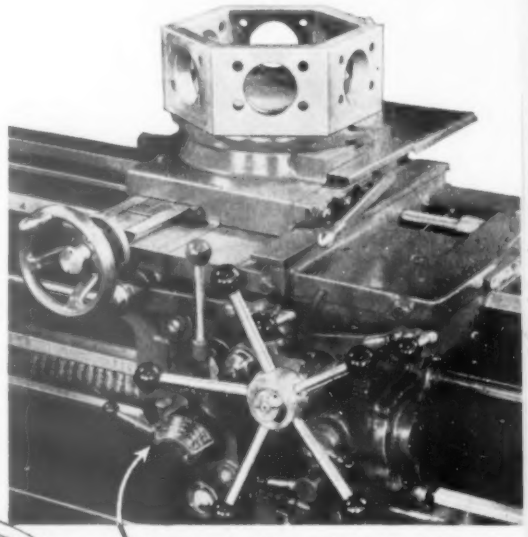
The NATIONAL TOOL Co.
11200 MADISON AVENUE CLEVELAND, OHIO

TOOLING PROBLEMS SIMPLIFIED

with Gisholt's Cross-Feeding Hexagon Turret

TODAY'S acute tooling problems can often be simplified by the cross-feeding hexagon turret, available on Gisholt High Production Saddle Type Turret Lathes. It can be used for facing, recessing, etc., or it can be set off-center for boring with simple, single-point tools. Tool investment is reduced. Set-up time is shortened.

Efficient on all kinds of turning work, the Gisholt cross-feeding hexagon turret is particularly useful on small-lot jobs where production is not large enough to absorb set-up time for multiple tooling. Sixteen power feeds are provided for both cross and longitudinal feeds. Adjustable feed trips are provided for both movements. Complete information will be sent on request.



Direct reading plates on the feed lever show feeds in thousandths of an inch. Feeds are engaged or disengaged by quick reversing levers. Send for literature.

GISHOLT MACHINE COMPANY

1219 East Washington Avenue • Madison, Wisconsin

LOOK AHEAD...KEEP AHEAD...
WITH GISHOLT IMPROVEMENTS
IN METAL TURNING

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

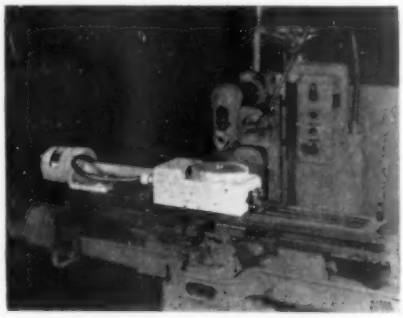
screw type tapping machines, according to the manufacturer, Detroit Tap & Tool Co.

Designed for precision tapping in production, the machines are rated up to a maximum of ⅞" diameter and 14 pitch in mild steel. The tapping spindle is controlled throughout the entire length of its stroke by sturdy guide rods. The driving end of the spindle is, in turn, controlled by the moveable head. Inaccuracy, caused by lead screw "wind-up," is precluded, especially on deep holes, by driving the tapping spindle at a point between the tap and the lead screw itself.

Lead Screw Tapping Machine

AUTOMATIC INDEX BASE *(M60)*

Built-in automatic accuracy, and elimination of extra handling and repositioning parts for multiple cuts are



Sundstrand Indexing Base

principal feature of two new automatic index bases recently announced by Sundstrand Machine Tool Co.

The 8" diameter base is designed as an attachment for the 00 and 0 Hydraulic Rigidmil and the 12" size is to be used with the No. 1 Hydraulic Rigidmil and the No. 2 Electromil.

Many possibilities for reducing milling costs are provided by use of the index base, according to the company. On a vertical position, it can be used with a tailstock for milling splines, keyways, slots and similar operations. It also can be used for milling parts chucked on the axis of the index base.

In a horizontal position the base can be used with station type indexing to load one part while another part is being machined. Also, castellated nuts, hexagons and similar shaped parts can be located on the axis of the base in the horizontal position.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

VERTICAL SPINDLE ROTARY GRINDER *(M61)*

Hanchett Mfg. Co. announces a new

(Continued on page 186)

Hanchett Rotary Surface Finder

A Big Handful of Help

FOR USERS OF OK TOOLS

LOOK FOR THESE TAGS ON OK TOOLS

When you receive an OK Tool with one of these tags attached to it, in your own interest, be sure to remove and read it carefully. These tags contain information that will go far to make the tools last longer and do better work.

There's a wrong and a right way to use a metal cutting tool. In these days, when not all the people working at the machines are "veterans," they need simple, practical help. So the information on these tags will help everybody.

INSERTED-BLADE METAL CUTTING
OK TOOL SYSTEM
MANUFACTURED ONLY BY THE O K TOOL COMPANY, SHELTON, CONN., U. S. A.

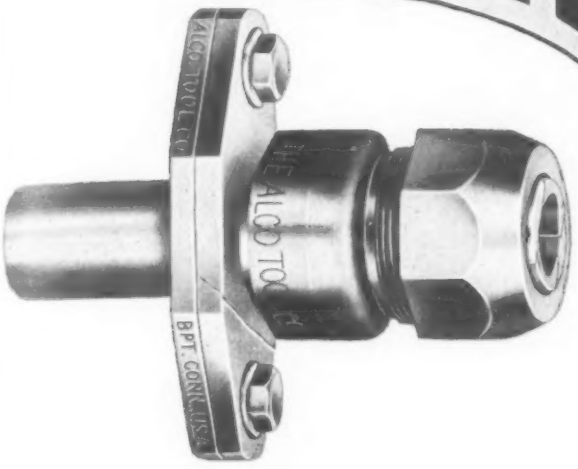
Releasing Model Tap and Die Holders

by

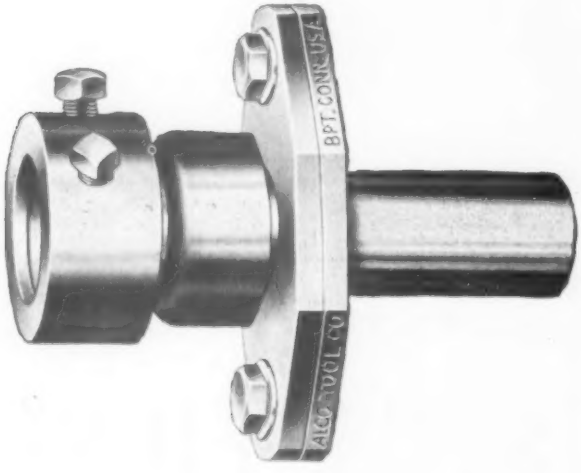
ALCO

for HAND SCREW MACHINES

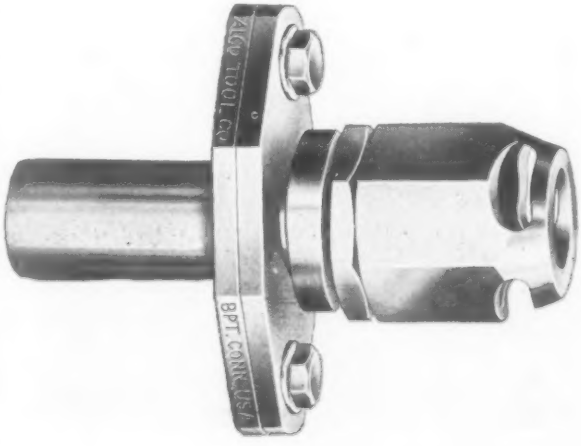
for TURRET LATHES



RELEASING TAP HOLDER . . . Holds taps securely by direct application of pressure in jaws — NO BUSHINGS NEEDED. Full floating flanges set taps absolutely concentric with hole. Result: Even wear on all leads of tap, no tap breakage, perfect threads.



RELEASING BUTTON DIE HOLDER . . . Simple button dies deliver full measure of high grade production in the ALCO holder. Adjustable, concentric alignment feature of this tool insures perfect threads and makes dies last longer.



RELEASING ACORN DIE HOLDER . . . The only acorn type releasing model with adjustable concentric alignment. Quick and positive set-up. Chip elimination and effective lubrication through adequate openings. Rigid drive mechanism — no pins used.

EFFICIENT

ALCO TOOLS

THE ALCO TOOL CO., 453 BIRDSEYE ST., BRIDGEPORT, CONN.

Chicago Office: 6219 S. Kenwood Ave., Telephone: Hyde Park 6807 — Detroit Office: 908 Stephenson Bldg.

large surface grinder with structural proportions considerably heavier and stronger than conventional type machines of equal capacity.

Designated as No. 24, this new verticle spindle rotary surface grinder has a 30" rotary magnetic chuck equipped with a demagnetizing switch and traversed into grinding position by push-button control. The grinding wheel head has hand, power, or automatic traverse with power being furnished by a 2 HP 900 RPM motor.

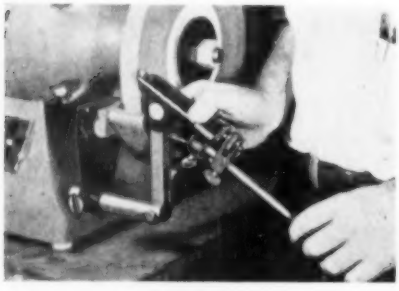
Other features of the machine are a rugged swing arm wheel dresser, an ammeter for determining the cutting action of the grinding wheel, and a flood light which aids in grinding to closer tolerances.

GRINDING FIXTURE *(M62)*

The Industrial Engineering Co. has developed an adjustable fixture in which twist drills can be ground to cut any degree angle from 30° to 90°.

According to the company, these fixtures prevent oversize, off-center holes, eliminate costly risks, improve work quality, increase twist drill life, and assure top production.

Brackets for the fixture are designed for Black & Decker, Van Dorn, bench or pedestal grinders. The manufacturer has available diagrams for special brackets for other make grinders.



Drill Grinding Holder

METAL CUTTER *(M63)*

Designed primarily to provide low-cost cutting with a thin cutting tool in large size materials, a new 20" x 20" capacity metal cutting machine has been introduced by Racine Machine and Tool Co.

According to the manufacturer, this

(Continued on page 188)

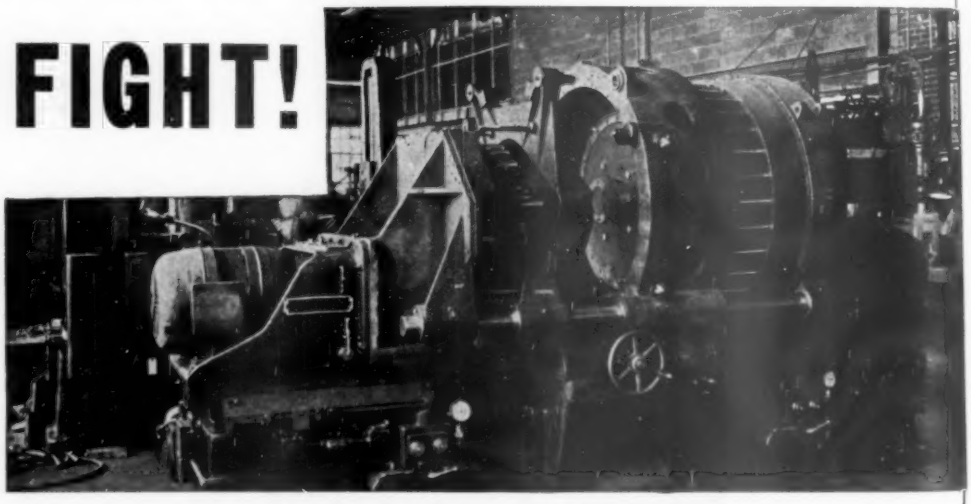
Racine Metal Cutting Machine For Use On Large Size Materials

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

VETERANS OF OTHER WARS

STILL FIGHT!



ANOTHER CONVERSION for HIGH PRODUCTION

ENGINEERS HAVE PUT VETERAN MACHINES OF OTHER WARS INTO

INCREASED PRODUCTION

LET BUHR HELP YOU INCREASE PRODUCTION SCHEDULES

Buhr

Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

ANN ARBOR BUHR MACHINE TOOL COMPANY MICHIGAN

Engineered Diamonds!

HERE'S YOUR ANSWER TO *Accurate Radii —*

• The form produced by a radius dresser is only as accurate as the diamond used to dress that radius form. It is because Wheel Trueing engineers know this—because they know the importance of extreme accuracy and precision in radius forming operations that the diamonds used in Wheel Trueing Radius Forming Tools are selected with the greatest care according to the particular radius each is to dress.

But careful selection of diamonds alone is not enough! The diamonds in these tools are set by experts who make certain that each diamond is concentric with the shank. And throughout the various manufacturing operations, these tools are subjected to rigid tests and careful inspections by men whose skill, experience and engineering knowledge cover the fields of industrial diamonds and grinding wheels. These men know diamonds! They know the production man's problems! They know how to design and manufacture tools to solve those problems!

Next time you buy radius forming diamond tools specify Wheel Trueing! You'll be assured of utmost precision, accuracy, dependable performance and money-saving economy. You'll get radius forming tools *engineered to your jobs!*

Other Wheel Trueing products include diamond tools for straight or form dressing—thread dressing—contact gauges—and drill bits for coring or blasting.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Ave. Detroit 6, Michigan

machine is particularly adaptable to use on die block steel and other costly materials. The light-weight blade removes a small amount of metal in the form of chips. Where multiple cuts are made a substantial saving results from this feature says the company.

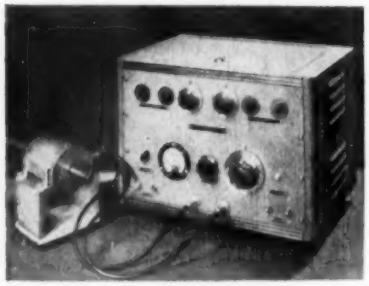
A special dual type feed provides a fast-cutting speed in light materials but at the same time is arranged for a positive predetermined rate of cutting in die blocks, alloys, and tool steel. Cutting speeds of 55-88 and 115 strokes per minute are provided by a three-speed transmission. The machine is hydraulically operated with full control placed on a single lever.

ELECTRONIC FLAW DETECTOR (M64)

General Electric Co. has announced a new, high-frequency, electronic flaw detector for detection of longitudinal cracks and seams in nonmagnetic metallic tubing in an extensive range of diameters and wall thicknesses.

According to the company, the instrument aids in detecting and locating imperfections ½" long, 10 mils wide, and ⅛ of the wall thickness in depth, even though they are on the inside of the tubing and do not appear on either surface.

Tubing to be tested is fed through a coil box and power is applied to the coils, which in turn induce eddy current in the tubing. A flaw in the tubing causes changes in these currents, and an electronic unit detects these changes and acts as a signal relay, thus disclosing to the operator the existence and location of the flaw.



High-Frequency Electronic Checker

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

PORTABLE CLEANING AND RINSING UNIT (M65)

Development of a portable combination metal cleaning and rinsing tank that eliminates the need of removing parts from cleaning tank to a rinsing receptacle is announced by Aeroil Burner Co.

By having two hot liquid dip tanks in one portable unit, the operator can clean and rinse metal parts and products with one machine, according to the company. One compartment contains hot liquid and the other a hot or cold rinse. Each compartment is heated separately by immersion tube heating units that deliver all of the heat in the cleaning solution and rinse water. The outfit is completely portable, requiring only plugging in to start operation.

Portable Metal Parts Cleaner

AUTOMATIC MILLING VISE (M66)

A new automatic milling machine vise capable of developing clamping pressures adjustable to 40,000 lbs. is announced by Bellows Co.

Designated as CVH-60, the new vise is powered by an air motor operating through pre-determined leverage on a line pressure of 80 to 100 lbs. According to the company, any desired degree of pressure may be applied and uniformly maintained throughout the day's operation, with air consumption extremely low, averaging less than 1/10th of a

(Continued on page 190)

For Surface Grinders

Nothing but praise when you use a Liberty High Speed Grinding Attachment for cutting those "difficult to get at" jobs.

Liberty Vertical Attachment, illustrated here, and the Liberty Horizontal Attachment are precision tooled for greater accuracy, and may be assembled to your surface grinder in 2 minutes without machining.

Their spindles are preloaded by an ingenious spring arrangement that guarantees perfect static and dynamic balance, and may be had with solid quill or collet chuck.

TOMORROW'S TOOLS
for
TODAY'S TASKS

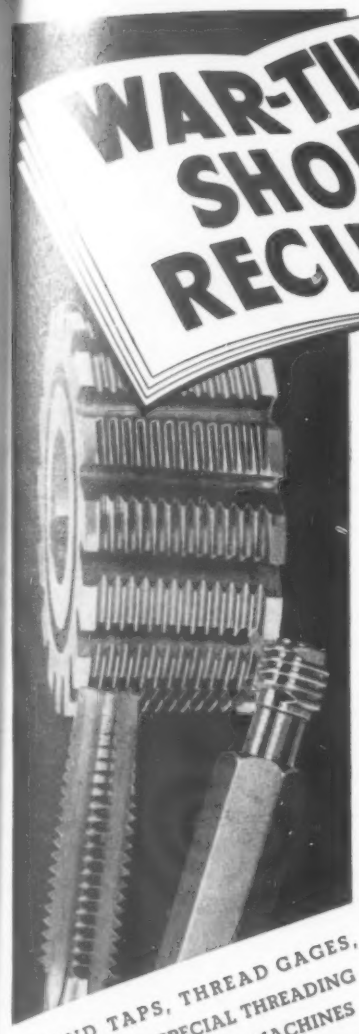
LIBERTY HIGH SPEED ATTACHMENTS for Surface Grinders

Grinding to close tolerances in blind end slot.

Send for Circular

LIBERTY TOOL & GAGE WORKS, INC.

233 Georgia Ave. **Providence 5, R. I.**



WAR-TIME SHOP RECIPES

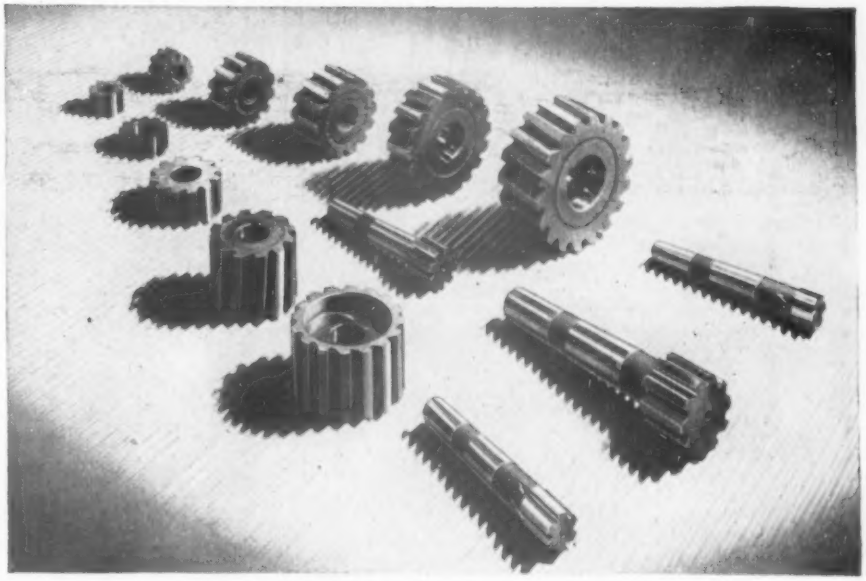
No. 7 IN A SERIES

GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES

Announcing

DETROIT

STANDARD THREAD MILLING CUTTERS



Produced in the Nation's largest plant devoted exclusively to thread milling cutters.

Precision ground to your thread specifications from finish machined and heat-treated STANDARD blanks carried in STOCK.

Speeds Delivery
Simplifies Ordering

For list of standardized sizes, ask for Bulletin No. BC-43

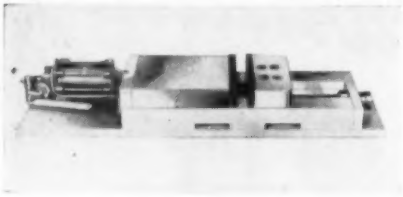
BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT, 11
MICH. U.S.A.

cubic foot of free air per cycle.

A double-acting valve with adjustable control lever is provided, permitting operation of the valve from any angle in any plane. The control lever may be



Air-Operated Milling Vise

synchronized with any moving part of the machine to provide fully automatic operation. The vise measures 27¾" x 6" x 4⅞" high. The maximum jaw opening is 5⅜".

RADIAL TYPE SPOT WELDER (M67)

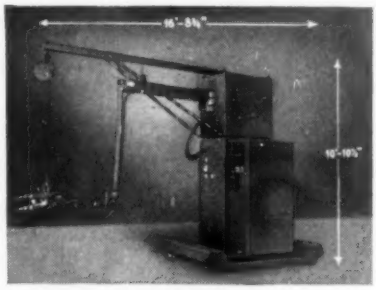
Ready access to crowded and fixed jigs is the principal feature outlined by Sciaky Brothers for their new radial-type gun spot welder, specially designed for aluminum and light alloys.

INFORMATION FREE
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

According to the company, tacking operations as well as structural welding on large or fixed aluminum structures can be accomplished with greater speed and efficiency.

Known as type PS2R-1, the machine employs a stored energy principle and variable pressure cycle. It is rated at 100 KW and has a capacity for aluminum of from two thicknesses of .016" up to .064".

Flexible cables are mounted to the gun on horizontal water-cooled copper bars of heavy section, which reduces electrical losses to a minimum. A 180°

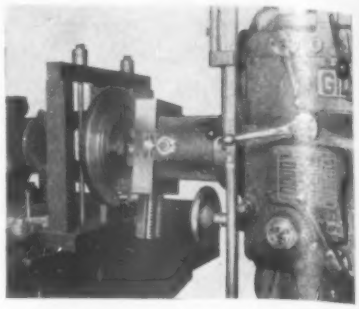


Flexible Spot Welder

pivot is possible and the machine area reached by the welding gun is represented by a half circle of 23 feet in diameter.

AUTOMATIC FACING AND BORING HEAD (M68)

Paper Converting Machine Co. has developed a new selective automatic feed facing and boring head for use on horizontal boring bars.



Facing and Boring Head

The new tool utilizes the forward and backward feed mechanism of the boring bar itself to feed the tool holder slide automatically inward or outward. The attachment is bolted to the spindle face of the boring bar. Construction is rugged enough to enable it to withstand almost any cut the bar itself will take, according to the manufacturer.

CIRCULAR CUTTING TOOL (M69)

Diamond boring machine results from an ordinary lathe are possible with a new, different type boring tool developed by the Shearcut Tool Co., according to the manufacturer. The tool has a circular cutting edge that lasts 10 to 30 times as long as straight edge cutting tools before resharpening is necessary, the maker states.

The shearing action of the boring bit leaves a curled chip and allows large

(Continued on page 192)

You need them—
You can get them Now!

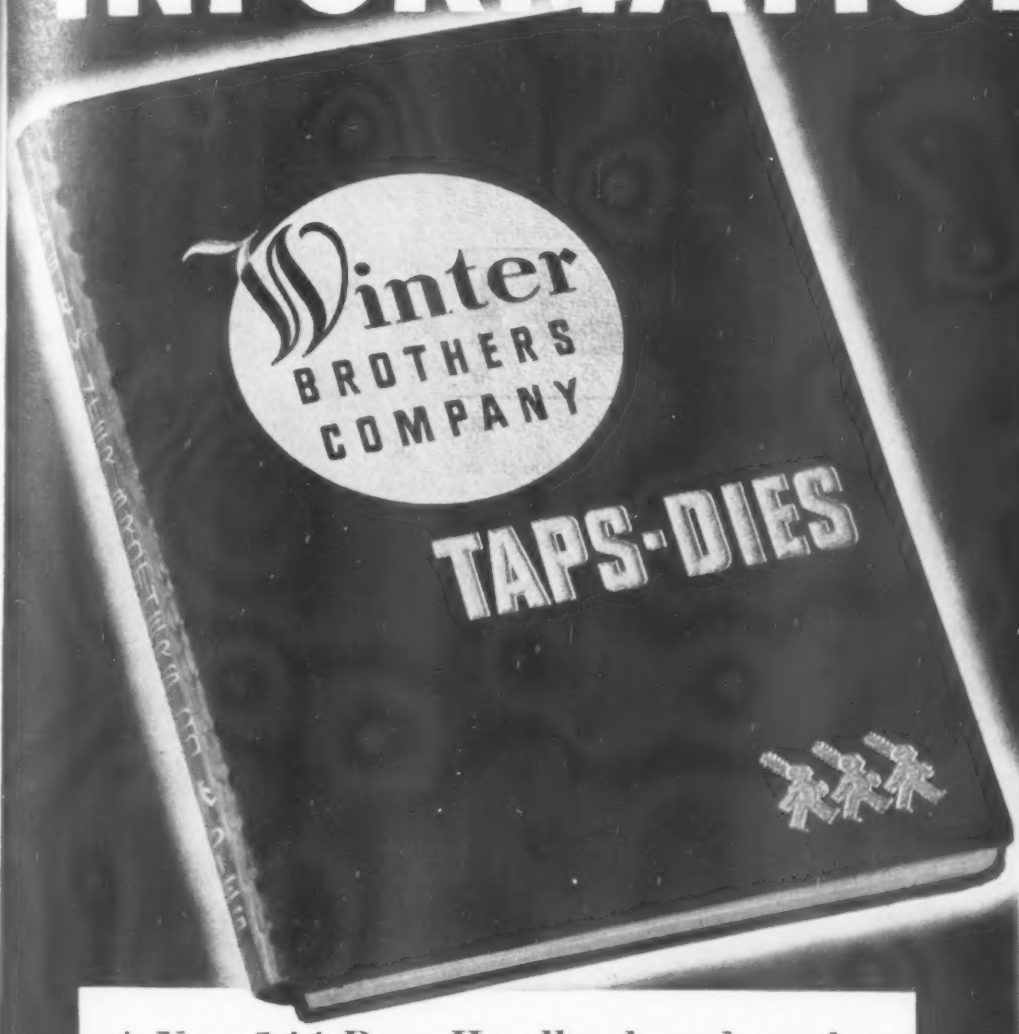
Tools that will help you produce faster. Visual gages for production or inspection that will check your work with extreme accuracy and speed. You need them for both your production and your tool departments. And we can now promise deliveries as follows:

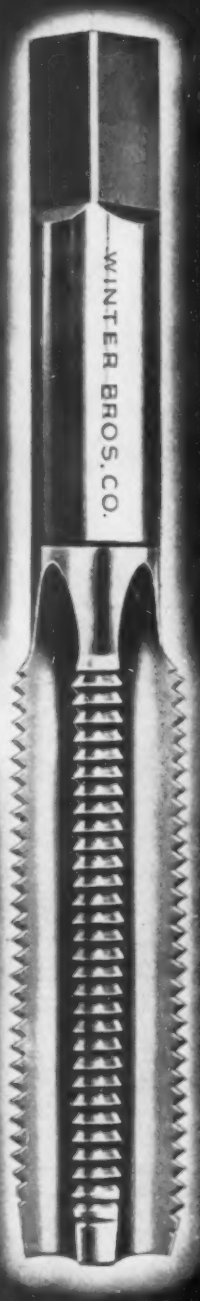
Lapping Plates	2 weeks
Radius dressers	3 "
Bench centers	3 "
Amplifying gages	3 "
Thread checkers	3 "
Hole checkers	Deliveries dependent upon special equipment required

In addition, we are making special tools and fixtures for Government and war plants. Keep this in mind when next in need of precision tools and gages. Designers and manufacturers of precision products since 1919. Write for Bulletin No. 43-TE.

THE AMERICAN GAUGE CO.
125 Bayard Street DAYTON, OHIO

INFORMATION?





A New 144 Page Handbook and catalog of useful data on TAPS & DIES especially cross-indexed for quick reference.

The answer to your threading problems.

Sent Free if requested on Company Letterhead.

Tap and Die Division of National Twist Drill & Tool Co., Detroit, Michigan

Winter Brothers

COMPANY
BRANCH STORES

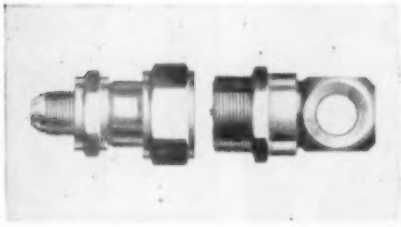
Wrentham, Massachusetts, U.S.A.
SAN FRANCISCO, CALIFORNIA · CHICAGO, ILLINOIS · DETROIT, MICHIGAN

Shearcut Circular Cutter

cuts to be taken without chatter. No new set-up is required when an edge becomes dull because a new one is provided by simply turning the bit in its holder. Other advantages cited by the maker are speeds up to 1,000 feet per minute, lower power requirement, and lower heat generation.

SELF-SEALING COUPLING *(M70)*

American Screw Products has introduced a disconnecting self-sealing coupling, said to withstand 2500 p.s.i. after ordinary hand tightening.



Heavy-Duty Coupling

The company states that tests show the heavy construction of the aluminum alloy body prevents distortion under severe handling conditions and that jamming of the spring-loaded shut-off valve is prevented. It states further that a sample coupling was crush-tightened with a long handled wrench but showed no leakage upon disconnection.

Other features are springs of heat-treated steel, lightweight cast phenolic poppets which are positive-sealing in action, and a synthetic gasket for leak-proof connection when coupled.

INFORMATION FREE

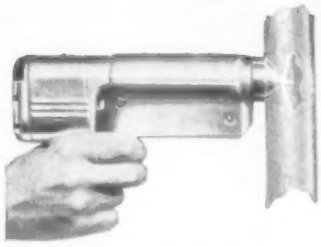
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 17y.

FAST ACTION BLIND RIVETER *(M71)*

A new rivet driver, capable of driving four "blind" rivets a minute, has been introduced by Independent Pneumatic Tool Co.

According to the manufacturer, tests have proved that the device will perform six to eight times faster in blind rivet installation than previous methods.

The tool operates in a 4-step cycle. The first step screws a mandrel into the rivet, the second pulls back the mandrel, upsetting the rivet, the third unscrews the mandrel and the fourth shuts off the tool. The device weighs only 4¼ pounds and measures 9½ inches. It has a speed of 1,000 r.p.m. forward and 2,000 r.p.m. reverse.

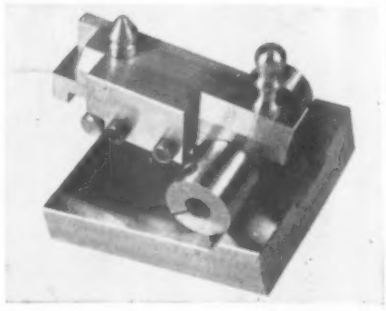


New Rivet Driver

SINE ANGLE WHEEL DRESSER *(M72)*

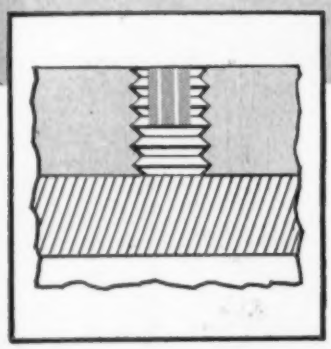
Need of costly special equipment or

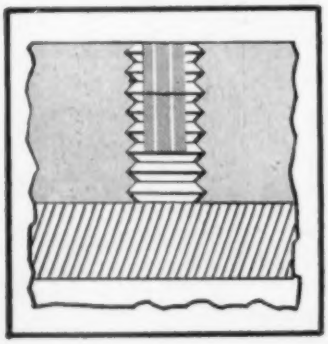
(Continued on page 194)



Florian Wheel Dresser

DESIGNED FOR **Safety**... BUILT FOR **Strength**





The advantages of hollow set screws include safety on revolving or moving parts, ease of assembly in confined places, and more compact construction.

Mac-it Hollow Set Screws offer these design features, plus great strength. They are heat-treated to resist upsetting of the point, rounding out of the hex sockets, and splitting of sockets at the corners.

The tremendous holding power of Mac-it Hollow Set Screws makes locking devices unnecessary in all but a few applications. In these cases, Mac-it Hollow Lock Screws are used like jam nuts to prevent any possibility of loosening.

Mac-its

PRONOUNCED "MACK-IT"

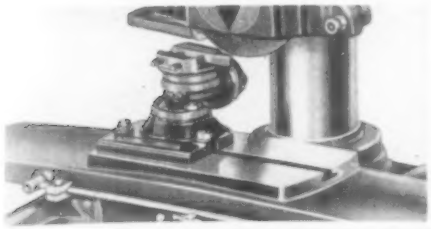
OTHER MAC-IT PRODUCTS INCLUDE:

Socket head cap screws, Stripper Bolts, Hollow pipe plugs, Hexagon head cap screws, Square head set screws

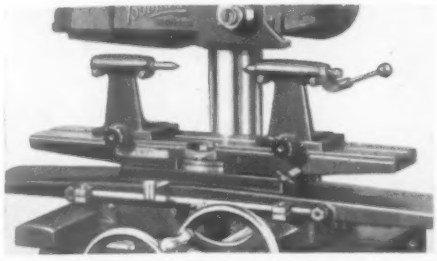
4341

Strong, Carlisle & Hammond Company • Cleveland, Ohio

1. As is . . it's a Surface Grinder



2. With the Univise . . it's a Chip-Breaker Grinder



3. With the Unihead . . it's a Tool & Cutter Grinder

DELTA
MILWAUKEE
Machine Tools

DRILL PRESSES—GRINDERS — CUT-OFF MACHINES — BAND SAWS ABRASIVE FINISHING MACHINES

Delta *now offers you . . .*

3 accurate, dependable grinders

Any one of these combinations — by itself — is "a heck of a lot of machine for the money". But take all three together, and you have a saving that no shop, large or small, can afford to overlook.

As a surface grinder, it's a husky, big-capacity machine — over 6 ft. high, weighs close to 700 lbs., grinds surfaces up to 13½" long, 6" wide. Designed for ease and speed of operation—with convenient controls, wide graduations on micrometer for close settings, many other latest features for accuracy and dependability.

As a Chip-Breaker Grinder, it gives exceptionally accurate results in grinding the chip-breaker groove on carbide-tipped tools. Equipped with the Univise, which holds the tool at any conceivable angle, may be reset at *precisely* the same angles as original setting without bothersome and often inaccurate measurements.

As a Tool & Cutter Grinder, it makes tool sharpening simpler, easier, cheaper, and extremely accurate. With the Unihead attachment, almost any conceivable angle can be ground.

For a real find that gives creditable results for years, investigate this modern, safe, good-looking machine. Consult your Delta industrial distributor (Delta sells only through distributors) or write for new bulletins. M-8

Specifications

Wheels must have 1¼" hole.
Table surface 5¾ x 13".
Traverse feed, one graduation is .001"
Micrometer adjustment ⅜" range, each graduation is .0005"
Spindle speeds (with 60 cy. 1750 R.P.M. motor) 3200 and 4200 R.P.M.

No. 24-105 Surface Grinder	$295.00
No. 24-205 Chip Breaker Grinder	343.50
No. 24-305 Tool & Cutter Grinder	370.00

Priority required, A-1-A or better, under restrictions of Limitations Order L-237.

TEAR OUT AND MAIL COUPON TODAY

THE DELTA MANUFACTURING CO.
611A E. Vienna Ave., Milwaukee 1, Wis.

Please send me your catalog and bulletins describing the Delta 3-in-1 grinder combination.

Name.....Position.....
Company.....
Address.....
City.....(.....) State.....

time-consuming makeshift set-ups for dressing the wheels of surface grinder tools to required angles, is eliminated by the use of a new sine angle wheel dresser, according to the manufacturer, The Florian Manufacturing Co.

According to the company, wheels may be quickly dressed to any angle from 0° to 90° with assurance that angles will be accurate within plus or minus 10 seconds. Standard gage blocks or adjustable parallels are used in conjunction with the dresser.

MARKING MACHINE (M73)

Heavy duty construction for stamping numbers and letters into steel, brass, zinc, plastic, fibre, and pressed

Acromark No. 8

wood plates and parts, is the distinctive feature of the new No. 8 Acromarker recently announced by The Acromark Co.

INFORMATION FREE
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

Another feature cited for the marker by the manufacturer is that it has a 9" reach, supposedly the largest capacity of any nameplate stamping machine made. The machine will accommodate pieces up to 2½" thick and as large as 10" by 12".

In operation, the automatic advance moves the plate or part being stamped in a level plane to the left after each character is stamped, spacing each letter to figure evenly. The table, to which work is held by a thumb clamp, is lifted against heavy duty marking dies by means of a powerful screw. A die wheel carrying a full set of letters and figures is easily turned to any character.

NUMBERED DIAMOND TOOL (M74)

Designed to eliminate danger of careless disposal of diamonds, a numbering feature has been developed by the Abrasive Dressing Tool Co. for its diamond tools.

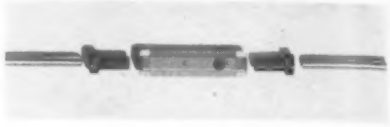
According to the manufacturer, diamonds are arranged in three layers of five each and are precisely spaced and staggered by maximum contact with the wheel at all times. A series of figures, denoting the number of diamonds in each layer, is stamped on the head of each tool. As the tool is

Diamond Dressing Tool

used, the number of diamonds remaining in each tool is indicated through each stage of wear, precluding the possibility of the tool being discarded before all diamonds have been used up.

PLASTIC GAUGE (M75)

Outstanding feature of the new "Plast-O-Lock" gauge is a collet of



"Plast-o-Lock" Gauge

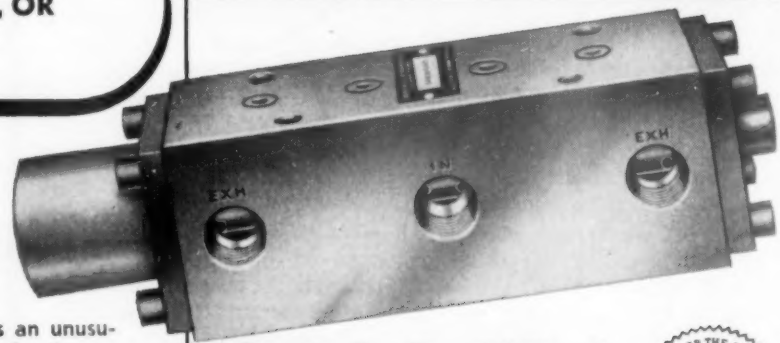
plastic, slotted and tapered to fit into the end of a standard gauge holder.

(Continued on page 196)

New Proven Type CONTROL VALVE

USE ANY ONE OF THE 50 STYLES FOR AIR, OIL, OR WATER . . .

Mechanically operated; Hand - Lever operated; Pilot operated, spring return; Double Pilot-operated



Quick-As-Wink valve design incorporates an unusually wide range of types and sizes. The single plunger type, made in more than 50 styles, operates to maximum pressure of 250 pounds.

Because this design can be moved by many operating devices, it is readily adaptable to a variety of applications on pressure operated equipment.

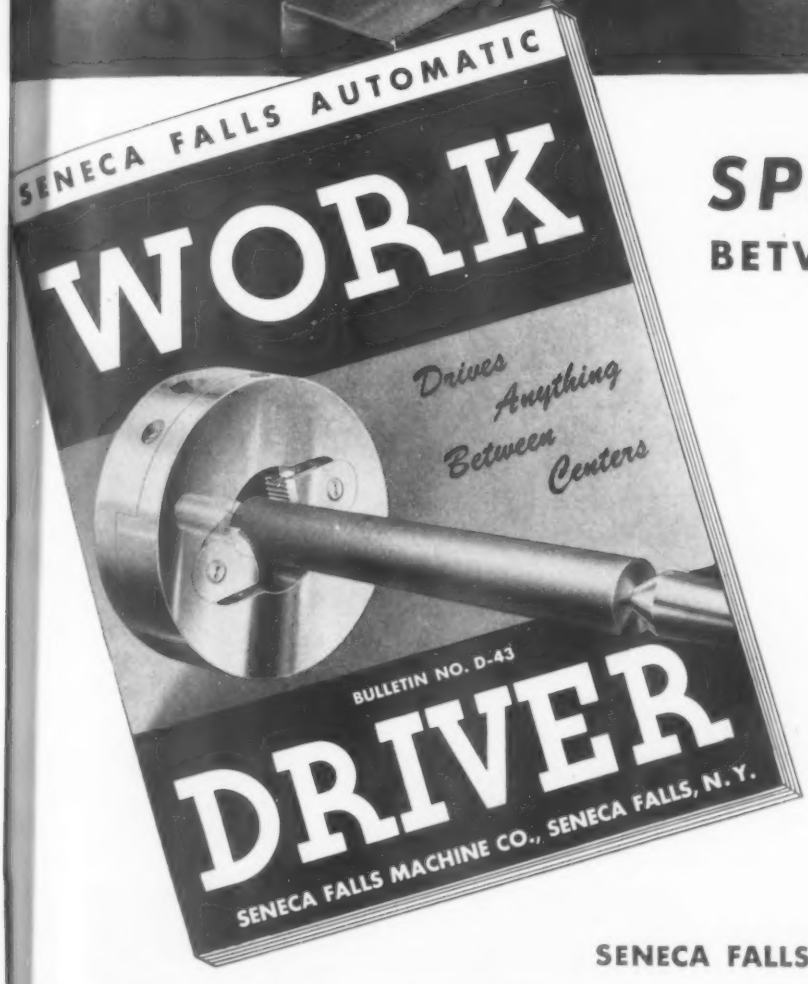
Our engineers will be glad to work with you on any valving problems.

Quick-As-Wink

THE HIGHER THE PRESSURE THE TIGHTER THE SEAL — AIR WATER OIL

Send for Catalog 6 for complete data.

C. B. HUNT & SON
1868 EAST PERSHING STREET · SALEM, OHIO



SPEED UP YOUR BETWEEN-CENTERS WORK

The Seneca Falls Automatic Work Driver is a self-centering, quick-acting Driver designed to eliminate dogging time, thus permitting one operator to operate two or more machines. Its positive grip prevents slippage and resulting tool breakage. It provides greater safety for the operator since there are no projecting screws or sharp corners to catch clothing or injure hands. It can be used on any type of engine lathe, multiple tool lathe and on plain or universal grinders. Can also be used for certain work on turret lathes.

Now available in eighteen *standardized* models which can be ordered from our new catalog. Write for your copy today and utilize this proven Driver to help speed your war production.

SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

LATHE NEWS from SENECA FALLS

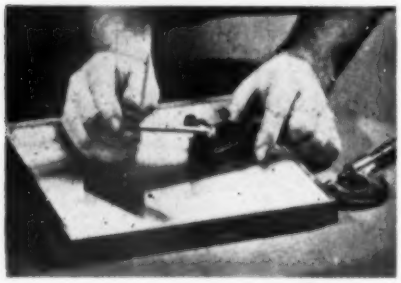
According to the manufacturer, Turner Gauge Grinding Co., hand pressure on the collet is sufficient to lock the gauge in the holder. A partial turn of an end wrench unlocks it to reverse the gauge or reset it at any desired protruding length. Another advantage cited by the company is that the plastic material used for the collet will not mar a lapped or polished surface and allows use of most of the gauge length for production purposes.

As the "go" and "no go" ends are worn beyond allowed tolerances, they are merely cut off, leaving an unused section ready for gauging.

SOLID GLASS SURFACE PLATE (M76)

Introduction of a new surface plate made of solid plate glass has been announced by Cadillac Glass Co.

Advantages cited for the plate are that desirable details and data may be etched on the under side, that the glass as it wears shows only scratches which do not burr or affect accuracy unless densely grouped, and that they do not require oiling or demagnetizing. Resurfacing is unnecessary, and accuracy can easily be checked.



Cadillac Glass Surface Plate

PNEUMATIC DIE CUSHION (M77)

Dayton Rogers Mfg. Co. announces a new pneumatic die cushion, self-contained and designed for quick and easy mounting directly to the bolster plate of practically any power punch press.

Dayton Rogers Die Cushion

The design includes an all-hardened-and-ground pin pressure pad that can be machined and fitted to press bed openings of the individual press used, thus increasing the pin pressure area.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

The new cushions can replace springs and rubbers on dies already in use. They are not limited only to controlling the draw ring on all deep drawing operations, but also may be used to control the pressure pad on many forming dies, according to the company. The cushion is furnished with a combination reducing regulator and valve-and-pressure gauge, together with high pressure hose fittings.

TRI-BIT FLY CUTTER (M78)

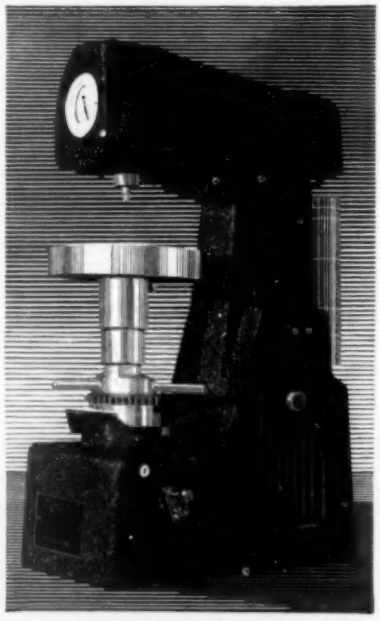
Weddell Tools, Inc. announces a new line of tri-bit fly cutters made with one or more teeth, set at suitable rake and shear angles.

The company reports these cutters are being widely used for high speed milling operations on aluminum or magnesium or for carbide milling of steel.

Cutter blades may be ground for roughing or finishing, or one blade may be ground to cut on the diameter for roughing and the other set ahead on the face and ground under diameter with a lead for finishing. The triangular tool bits are locked into position with a single lock screw. Adjustment for size or wear is made by a single screw.

(Continued on page 198)

"ROCKWELL"
HARDNESS TESTER



Shipment within a few days of these enormously improved new models

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MECHANICAL INSTRUMENT CO. INC.

Save Drills!

Because they are straight and round and because of their super-finished bores, Universal Drill Bushings last longer—save wear and tear on valuable drills.

For accuracy and longer tool life it will pay you to use Universal Drill Bushings. Write for facts.

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FRANKENMUTH, MICHIGAN

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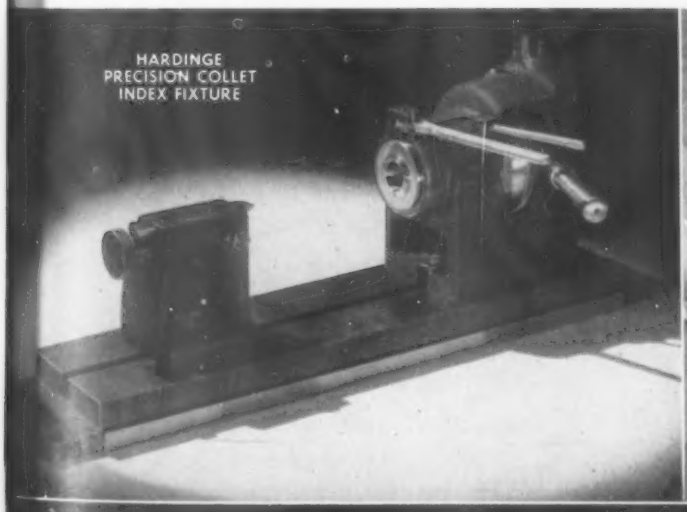
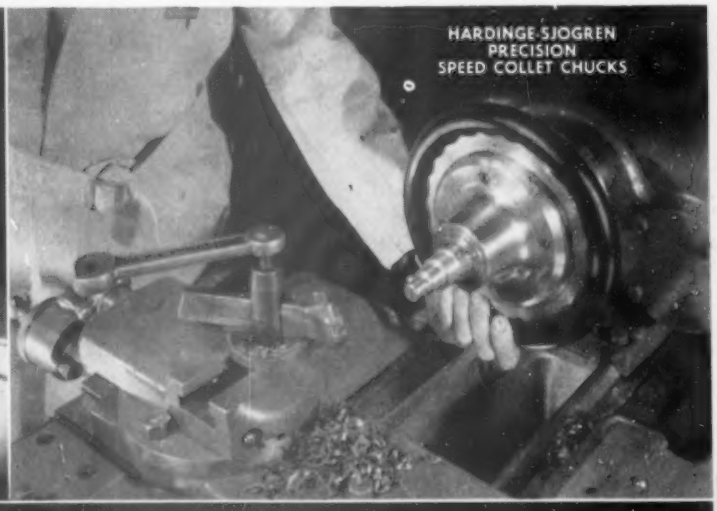
Performance has established leadership

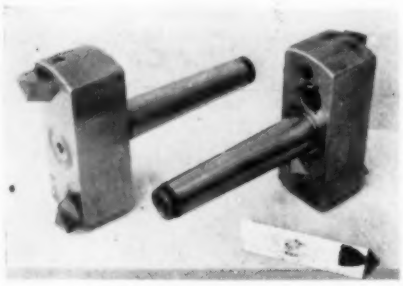
for HARDINGE Precision Equipment





HARDINGE BROTHERS, Inc., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



Weddell Fly Cutters

The bits are available in high speed steel, cast alloys, or carbide tipped. Cutter bodies are heat-treated alloy steel or of mehanite castings.

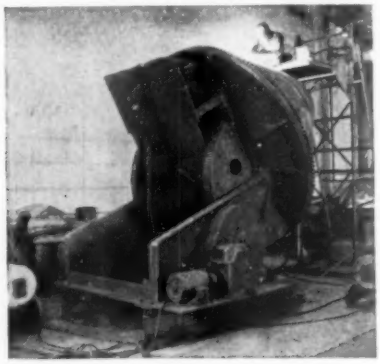
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 179.

WELDING POSITIONERS AND SPECIAL FIXTURES (M79)

Complete engineering service on welding positioners and special fixtures now is being offered by Quickwork Division of Whiting Corp.

The company is equipped to develop all sizes of equipment from small hand-operated units to large machines with capacity of 20 tons or more. The positioners are engineered to the special needs of a particular plant. Use of the positioners, according to the company, facilitates accurate downhand welding, reduces costs in operating time, and



Quickwork Welding Positioner eliminates tying up overhead cranes during the welding process.

NEW SMALL SOLENOID (M80)

A new midget-sized solenoid that permits designing of electrically-actuated valves and other controlling devices into compact units requiring less space than would be required for larger solenoids, has been introduced by the John S. Barnes Corp.

According to the manufacturer, the solenoid is unharmed by oil or coolant, and feet and side plates are integral for greater strength and rigidity.

COOLANT PUMP (M81)

A new immersed type motor driven gusher pump equipped with integral flange bracket for reservoir cover or bed-plate mounting has been announced by Ruthman Machinery Co.

Known as Model No. 9040 the pump is available in two lengths. Dimensions from the mounting flange to the bottom of the pump are 6-7/16" and 8-7/16". It is available with either ½" or ¾" size discharge. The totally enclosed ¾ h.p. operating motor is equipped with a one-piece rigid shaft.

(Continued on page 200)

Ruthman Coolant Pump

SAFE-LINE

WIRE ROPE CLAMPS

Write for details of this—the only PERFECTED wire rope clamp on the market. Millions used by Manufacturers, the Armed Forces and Industries.

NATIONAL PRODUCTION COMPANY

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PRODUCT REJECTIONS thru faulty Standards

Reduced!

SMITH *Master* SURFACE PLATES have gained a nation wide reputation for helping industry in the battle of production. Maximum Flatness.

Immediate Delivery on Standard Sizes

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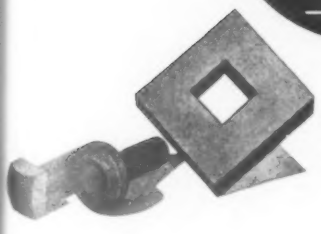
THE SMITH TOOL & ENGINEERING CO.

862 Sandusky Ave., Bucyrus, Ohio

HOW one tool engineer eliminated tool breakage and increased production



◀ *This job required a tool steel with a good combination of hardness and toughness.*

the tool:

A trimmer die for trimming cold forged blanks for machine bolts and cap screws of SAE 1020.

the problem:

Excessive breakage resulted when the tools were left hard enough to provide maximum wear resistance. But when the tools were drawn back far enough to eliminate breakage, they required too frequent redressing—resulting in considerable machine shut-down time and lost production. Several types of tool steel were tried, none of which met the requirements of the job.

the solution:

The Tool Engineer needed a tool steel that had a good combination of hardness and toughness. So using the Carpenter Matched Set Method of selecting tool steel, he found that *Carpenter No. 11 Special* promised to give a good combination of these qualities.

the results:

With *Carpenter No. 11 Special,* a straight carbon (tough timbre) water-hardening tool steel, these results were obtained.

1. *Breakage was licked—and production was increased from 7,500 pieces to 86,000 pieces per grind.*
2. *An increase from 5 hours to 60 hours in production time between grinds.*
3. *Machine shut-down time of 1 hour and 12 minutes per day was eliminated.*
4. *Added machine capacity—1,728 pieces per machine per day.*

This is another example of how the Carpenter Matched Set Method of selecting tool steel has been used successfully. If you would like to know how it can help you get tools that give increased production with fewer interruptions, ask for a copy of the 167-page Carpenter Matched Tool Steel Manual. It contains much useful information to help you select the proper tool steel for practically any type of tool. A note on your company letterhead will start your copy on its way, so drop us a line today.

THE CARPENTER STEEL COMPANY
122 W. Bern St.
READING, PA.

Carpenter MATCHED TOOL STEELS

WHAT PROBLEMS ARE YOU FACING?

This Organization—one of the largest in the world—with an extensive staff of skilled production engineers—can help you

Perhaps we cannot accept your immediate problem—

Today we are deeply engrossed in the biggest job anyone can do—the task of pushing war production toward an early realization of Victory Day.

Let us remind you, however, of our facilities and suggest that you discuss your future plans with us *now* in order to be prepared *before* you actually encounter the need and be better able to "carry on" your production without too much confusion.

HOW WE CAN HELP YOU

- Improve old products.
- Develop new products.
- Lay out plants, select machinery.
- Design new dies, fixtures, tools, gages.
- Work out efficient production schedules.
- Take kinks out of production.
- Develop new processes.

ENGINEERS
DESIGNERS
CONSULTANTS

PIONEER ENGINEERING AND MANUFACTURING CO.

19645 JOHN R
DETROIT 3, MICH.

—NEW EQUIPMENT—

THREAD LEAD CHECKING INSTRUMENT (M82)

Designed for rapid and accurate checking thread lead to an accuracy of .0001", a new production type leadcheck has been developed by Sheffield Corporation.

Sheffield Leadcheck

The instrument will handle threaded length up to a maximum of two inches. It will check threads as fine as 40 pitch or as coarse as 2¼ threads per inch, and will accommodate parts with diameters ranging from .125" to 2".

INFORMATION FREE
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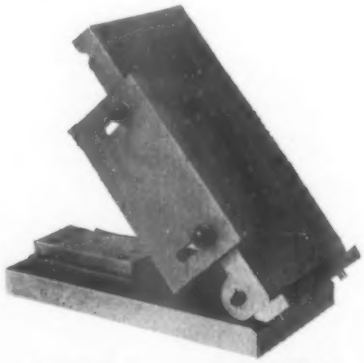
SINE PLATE (M83)

Designed to facilitate accurate checking of angular measurements in the inspection of tools and production parts, a new sine plate has recently been placed on the market by Carruth Sales Co. The instrument will accommodate tools or production parts ranging from extremely small pieces to those as large as 6" x 10". Gauge blocks are used to obtain the desired angles between the stationary locating plate and the cylindrical gauge bar on the movable block. For clamping work for inspection, 54 tapped holes of ⅜" diameter are provided in each block.



Angle Measurement Sine Plate

THE END

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CATALOG C
3rd Edition
WALES
"AA" "C" "CA" and "Z"
HOLE PUNCHING UNITS
WALES TYPE "C" HOLE PUNCHING UNITS FOR PRESS BRAKES
WALES TYPE "AA" HOLE PUNCHING UNITS FOR TEMPLATE MOUNTING IN STAMPING PRESSES
WALES-STRIPPIT CORPORATION
NORTH TONAWANDA, NEW YORK

EASY TO ORDER FROM

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ILLUSTRATES HOW TO OBTAIN MAXIMUM PRODUCTION OUTPUT

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● This fully illustrated catalog describes the exclusive time-saving, money-saving advantages of Wales Type "C" Hole Punching Units.

Functional coloring throughout this catalog simplifies ordering and specifying these Units.

Read how Wales Hole Punching Units step up metal fabrication by WRITING FOR YOUR COPY OF CATALOG "C" TODAY.

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Specialists in Punching and Notching Equipment

HEADQUARTERS FOR SPECIAL CUTTING TOOLS

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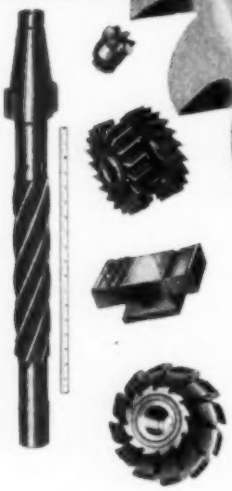

Here at A.C.E. we make specials by the dozen—instead of standard tools by the thousand. Naturally we have to know how to make all kinds of specials—make them accurately and economically, and maintain delivery schedules.

Send your inquiries for special cutting tools to A.C.E. Bulletin on request.

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AND ENGINEERING CORP., WARREN, MICH.
SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINT

Darwin

TOOL STEELS

A NEW CATALOG CONTAINING ANALYSES, HEAT TREATMENT, PERFORMANCE DATA AND RECOMMENDED USES.

From cover to cover, this catalog is packed with up-to-the-minute information on Darwin and Milner die steels, high speed steels and tool bits which are setting new production records . . . contains a steel selector section and tables to aid in choosing just the proper steel for the specific job.

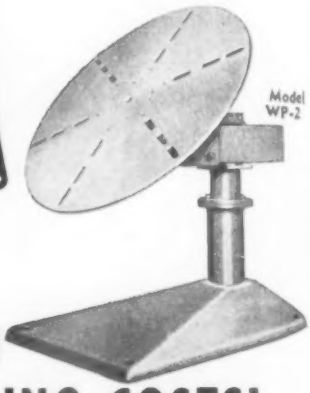
DARWIN & MILNER INC.
highest grade tool steels
1260 WEST FOURTH STREET
CLEVELAND, 13, OHIO

SCHAUER SPEED LATHES

- Meet stepped-up production schedules by employing SCHAUER SPEED LATHES for the final finishing operations on small metal and plastic parts.
- Speed, accuracy, continuous, trouble-free operation make SCHAUER SPEED LATHES production necessities in every plant. A size and type for every purpose. Write for Catalog 420.

SCHAUER MACHINE COMPANY
"Originators of Today's Speed Lathes"
2066 Reading Road • Cincinnati, Ohio

P&H WELDING POSITIONERS



NEW!
LOW PRICED!
CUTS WELDING COSTS!

- 2500 pound capacity at surprisingly low cost.
- All-welded rolled steel construction.
- Most versatile positioner in its class. Simple and easy to operate.
- Large table area with handy slots.
- Hydraulic power tilting.
- No exposed gearing.
- Manual turning to suit welding speed. Positive table locking device.
- Telescopic elevation.
- Portable or column-in-floor mounting.
- Also available with handwheel or power turning.

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ARC WELDERS • EXCAVATORS • ELECTRIC CRANES P&H MOTORS • HOISTS • WELDING ELECTRODES

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New

FLEX-ABRASIVE WHEELS and POINTS

Save Time and Labor Speed Production

The flexible construction of Flex-Abrasive Wheels and Points has created an indispensable item for use from tool room to assembly line. They place a fresh abrasive surface constantly in contact with the work.

Flex-Abrasive Wheels and Points can easily and speedily precision shape, grind and finish in difficult and "hard to get at" holes, corners and angles, as well as regular surfaces of hard alloy steel, wood, rubber, resin and plastics. They are designed for maximum safety on both high and low speed tools. Available for immediate shipment.

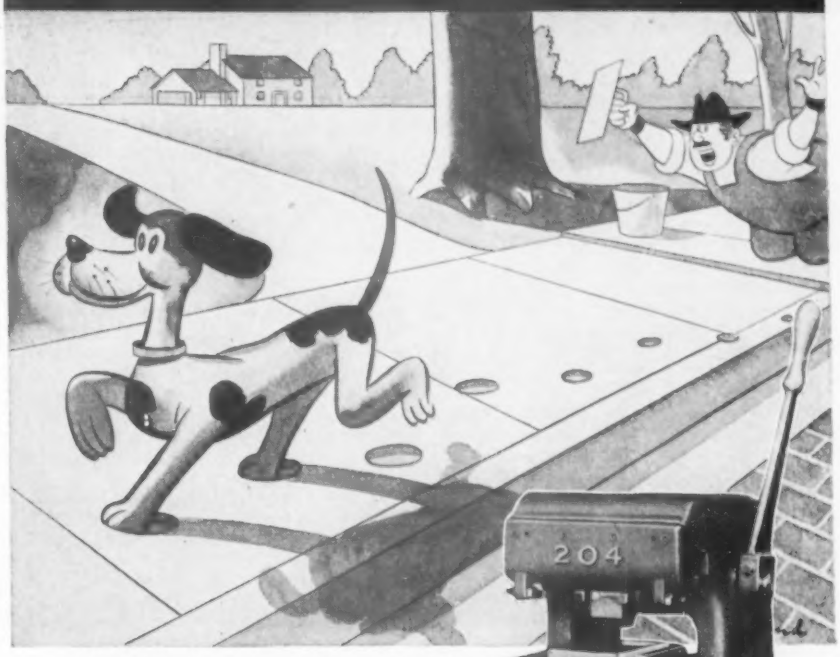
Mandrels of tapered thread construction instantly lock abrasive wheel to shaft by rotary motion, eliminating use of chucks, grommets and other time-consuming devices.

Send for Samples and Catalog

THE FLEX-ABRASIVE CO.
REG. U.S. PAT. OFF.

Division TE, 100 N. LaSalle St., Chicago, Ill.

DEEP... LEGIBLE MARKING!



with Matthews No. 204

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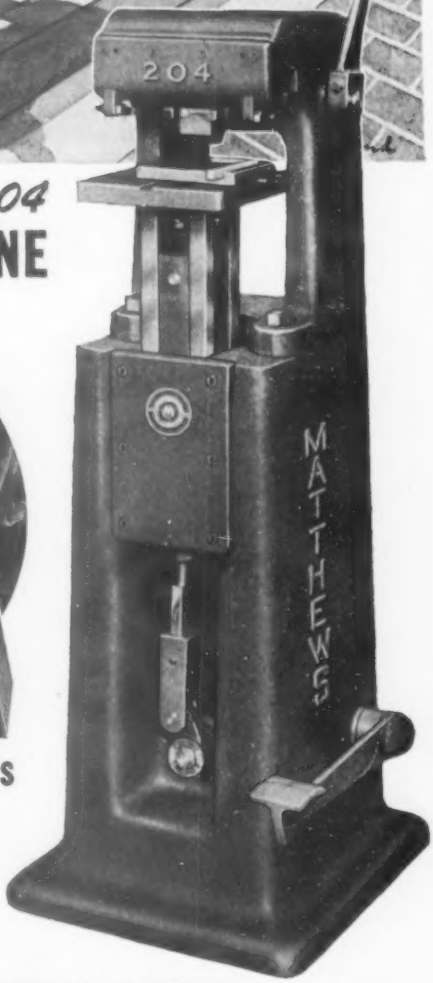

MARKS ROUND OR FLAT PARTS

A range of parts up to 6" in dia. or thickness . . . legibly marked with this NEW General Purpose Marking Machine. Round parts marked with flat dies . . . flat parts marked with roller dies.

Write today for literature!

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NEW LITERATURE

T. M. REG. U. S. PAT. OFF.

OF INTEREST TO PRODUCTION EXECUTIVES

(925) Metal Working Machinery

W. F. & John Barnes Co. announces that individually bound sections from its new 50-page loose-leaf data book will be sent to interested persons. The individual sections in paper covers deal with multiple drilling and reaming machines, boring and facing machines, milling machines, deep hole machines, miscellaneous machines, and data sheets. Persons requesting this literature should specify which particular section they wish to receive.

(926) Carbide Tools

Manual of Carbide Tipped Tools. Carbide Fabricators Co. This catalog contains in addition to listings of lathe tools, reamers, end mills, core drills and centers, a compilation of useful engineering data. Representative of the material contained in the technical section of the book are useful formulas, metric system conversion tables, decimal equivalents, methods of calculating shank sizes and tip sizes for cemented-carbide tipped turning tools, bolt circle layout, and information on sharpening reamers.

(927) Grinding

Norton Company has just published a new booklet, called **The A B C of Internal Grinding.** Designed primarily as a hand book for operators of internal grinding machines, it endeavors to answer some of the practical questions asked by machine operators. It covers setting up the grinding machine for each job, selecting the proper grinding wheel for the job at hand, and covers common grinding troubles and how to correct them.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 179.

(928) Welding

Fundamentals of Electronic Control For Resistance Welding. This 46-page booklet, designated as GET-1170 and published by General Electric Co., consists primarily of published articles by G.E. engineers on circuits and operations of electronic controls for resistance welding.

Articles reproduced in the booklet are entitled "Electronic Welding Control"; "Seam and Pulsation Welding Controls"; "Special Welding Controls"; "Timers for Welding Control"; "Energy Storage Welding Controls"; and "Servicing Resistance Welding Controls."

(929) Sintered Carbide

Firth-Sterling Steel Co. announces that it is issuing a reprint of the Firthite Color Chart in a folder for use in engineers' manuals and data books. The color chart ties in with the newly-developed Firth-Sterling system of color branding its various grades of sintered carbide for easy identification. Because the wall charts containing the color information are too heavy for insertion in engineers' manuals, the new folder has been published for this purpose.

(930) Hydraulic Presses

Hydraulic Straightening and Bending Presses. Watson-Stillman Co. This new bulletin, designated as **No. 320-A**, contains 38 pages of descriptive matter, illustrations, and tables of work capacities of the company's line of straightening and bending presses. Ten standard presses are treated individually in separate chapters. Requests for the booklet should be made on the writer's business letterhead.

(Continued on page 206)

761
STOCK ITEMS
ALL OF WHICH CAN BE DELIVERED WITHIN
48 HOURS

End mills that you need immediately are in stock—ready for shipment to you from the Putnam Tool plant or from the headquarters of a number of the Putnam sales representatives. In addition, complete stocks are now built up on end mill holders, continuous pilot counterbores and spiral fluted chucking reamers.

The items available include not only all popular sizes and types but many which, from any other source, would be considered special tools. To facilitate your production schedules . . . to get the maximum in tool economy . . . it's to your advantage to think of Putnam tools *first!*

TODAY . . . OUR CATALOG IS OUR STOCK LIST

ARMY E NAVY

PUTNAM TOOL COMPANY
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NICKEL AIDS THE AUTOMOTIVE INDUSTRY

to KEEP 'EM ROLLING!

Using ingenuity and "know-how" born of long experience, automotive engineers designed the phenomenally successful transport equipment that now speeds the United Nations on the road to Victory.

Built to take punishment far above peacetime requirements, these specialized military vehicles are being produced in quantity by the mass-production methods that have amazed the world. From North Africa to the South Pacific, these trucks, jeeps, tanks and half-tracks have repeatedly met wartime demands for stepped-up performance.

This kind of engineering-thinking pioneered the application of Nickel alloyed materials. Now, when uninterrupted operation is so vitally important, the continued and widespread use of Nickel is clear evidence of its many advantages.

In steering knuckles or differentials, in forged gears or cast blocks, a little Nickel goes a long way to provide essential dependability. It improves strength/weight ratios, increases wear and corrosion resistance, imparts toughness, and assures uniform properties of the other metals with which it is combined.

Today, maintenance crews on far-off battle fronts are learning what metallurgists and engineers here long have known . . . that, properly used, Nickel aids to "keep 'em rolling."

For years the technical staffs of International Nickel have been privileged to cooperate with automotive engineers and production men . . . men whose work is now so necessary to the Nation. Counsel, and printed data about the selection, fabrication and heat treatment of ferrous and non-ferrous metals is available upon request.

★ *Nickel* ★

For lists of current publications, please address Technical Library Service

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York, N.Y.*

(931) Heat-Treatment

Electric Furnaces. 82 pp. General Electric Co. This book describes types of electric furnaces made by General Electric, indicates the applications for which each type is most suitable, and presents outline drawings showing construction details of furnaces typical of those described.

Also included is a section devoted to descriptions and illustrations of various types of standard and special control equipment for electric furnaces.

(932) Oil Conditioners

Winslow Engineering Co. has published a new booklet dealing with the use of its oil conditioners and oil filters in industrial applications.

The booklet illustrates and describes typical installations of oil filtration equipment for tool cutting, hydraulic transformer, and lubricating oils. Included are application of filters or conditioners to machine tool operations, hydraulic devices, heat exchanges, and general lubrication.

(933) Welding

Preventing Welding and Cutting Fires. 16 pp. International Acetylene Ass'n. Designed to instruct users of welding and cutting equipment in reducing potential fire losses, this booklet contains a brief, clear discussion of the causes of fire and practical common sense measures for preventing them.

It discusses why a fire may start, locating of work, preventing fires, oxy-acetylene apparatus, and precautions necessary to put out fires if they occur.

(934) Checking Equipment

Catalog 836, now available from the Challenge Machinery Co., lists the concern's line of precision equipment for machine and tool industries.

Included is information on surface plates, layout plates, checking tables, turn tables, bench plates, lapping plates straight edges, angle plates, parallels, angle irons, and v-blocks.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 179.

(935) Speed Calculator

The Eastern Machine Screw Corp. has developed a speed calculator which it is making available at a price of 15c each. The calculator consists of a disc mounted on heavy cardboard. By setting arrows indicating diameter of stock and surface speed feed per min. at the proper designation, turning speed and threading speed are determined.

(936) Wheel Dressers

Calder Manufacturing Co. announces publication of two new bulletins. **Catalog No. 38** illustrates the company's wheel dressers and cutters. Also available is a folder describing advantages of Calder dressers and cutters.

(937) Taps

Greenfield Tap and Die Corp. has published a new hand book for tap users entitled **Selecting the Right Tap for the Job.** Included are discussions on the type of taps to use, selection of carbon or high-speed taps, cut thread or ground thread taps, precision ground thread tap limits, tapping speeds and lubrication. Several charts are included showing thread limits, pitch diameter, tap drill sizes and percent of thread, and decimal equivalents.

(938) Stainless Steel

The Jessop Steel Company has published a new catalog entitled **Jessop Stainless-Clad Steel.** It includes information on analysis, applications, manufacture, fabrication, styles of heads and standard size of sheets and plates. Sections dealing with deep drawing, grinding, polishing, cleaning, gas-cutting, riveting, soldering, and welding are included.

(939) Heat Treating

Perfection Tool & Metal Heat Treating Co. has just issued a circular on its "Nusite" process for hardening high-speed steel. The circular describes the company's "Silver Finish" hardening and "Deep-freezing" processes.

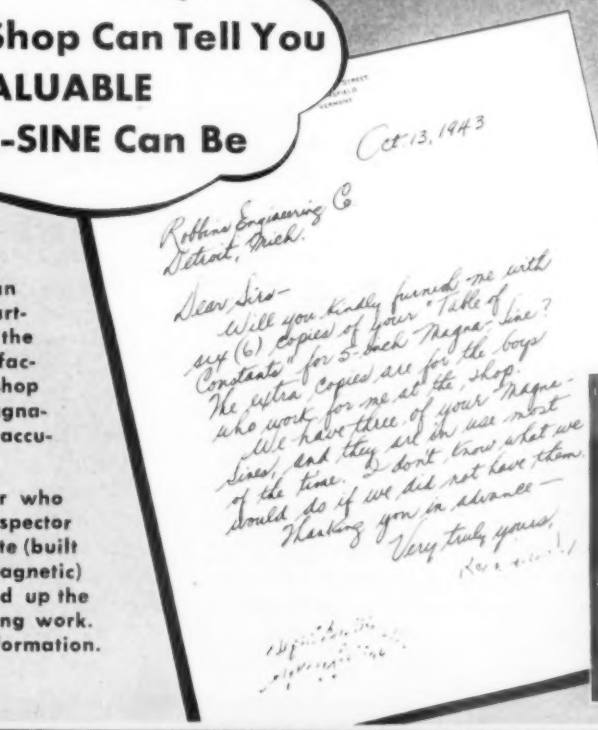
Also announced by the company is receipt of Army and Navy aircraft approval for heat treating.

(940) Milling

Milling Small Parts. Sundstrand Machine Tool Co. Designated as Bulletin No.-1, this circular contains descriptive information on the principal specifications of the company's No. 1 hy-

(Continued on page 208)

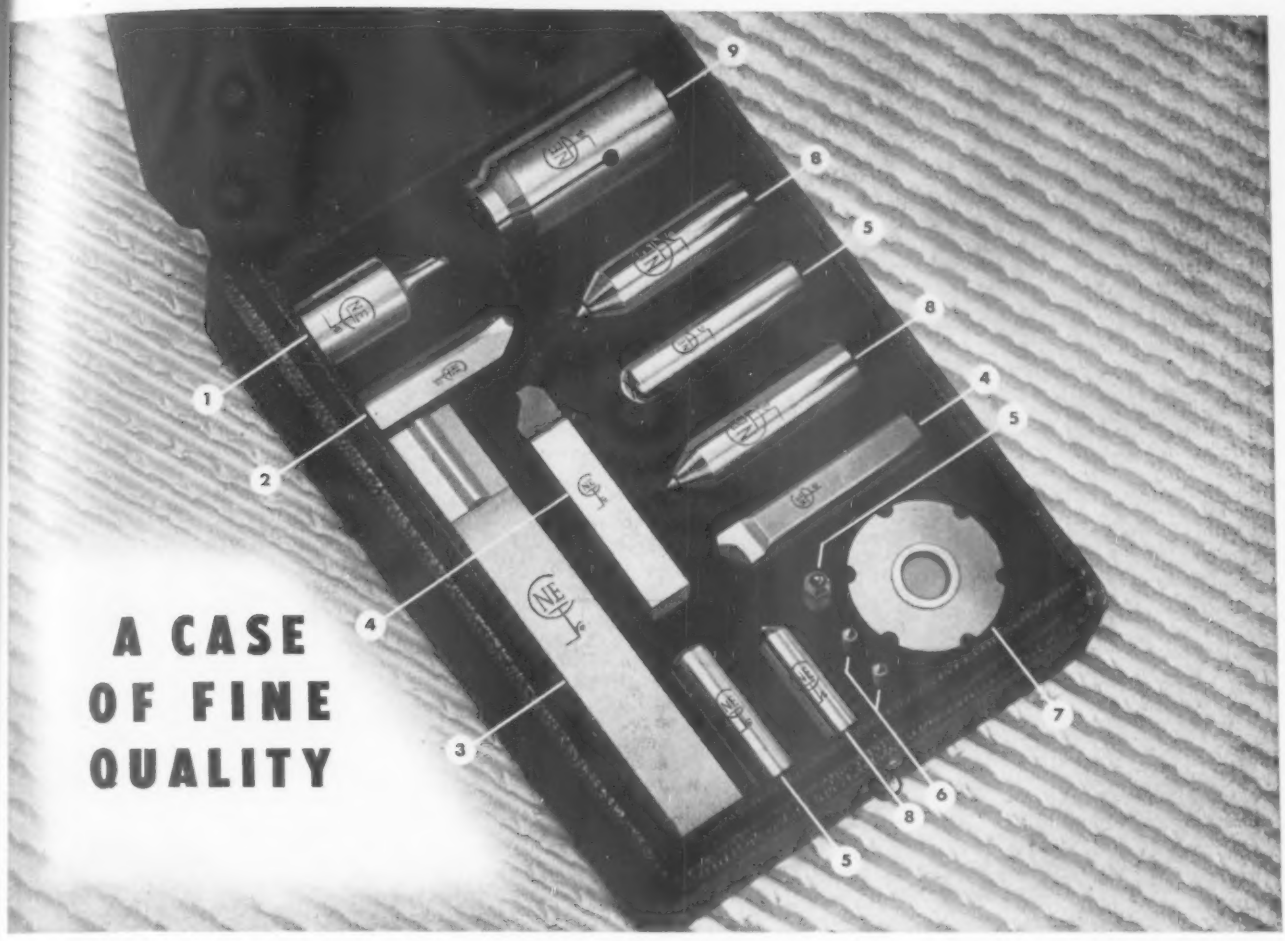
The Men In The Shop Can Tell You How VALUABLE The MAGNA-SINE Can Be


Oct. 13, 1943
Robbins Engineering Co.
Detroit, Mich.
Dear Sirs—
Will you kindly furnish me with six (6) copies of your "Table of Contents" for 5-inch Magna-Sine?
The extra copies are for the boys who work for me at the shop.
We have three of your Magna-Sines, and they are the most used of the time. I don't know what we should do if we did not have them.
Thanking you in advance—
Very truly yours,

This letter was written by a man working in the Special Tool Department of one of the best known of the New England machine tool manufacturers. Like hundreds of other shop men, he knows first hand that the Magna-Sine makes possible faster, more accurate angular set-ups.

Check with any machine operator who has used the Magna-Sine or any inspector who has used the Robbins Sine Plate (built on the same principles but non-magnetic) and you'll realize how they speed up the production of any angular grinding work. Then let us send you complete information.

ROBBINS ENGINEERING COMPANY
318 MIDLAND AVENUE • DETROIT 3, MICHIGAN



1. Special Carbide or Diamond Boring Tools. **2.** Shaped Diamonds for Jones & Lamson Thread Grinders. **3.** Special Carbide Tipped Tools. **4.** Special Carbide or Diamond Tipped Boring Tools. **5.** Tungsten Carbide, Boron Carbide and Diamond Gage Contact Points. **6.** Diamond Phonopoints for Tap Grinders. **7.** Solid Carbide Burnishing Nests. **8.** Octahedron Diamonds in either Jones & Lamson or Excello Holders. **9.** Collets and Bushings with Carbide Inserts.

Quality is the case in point—exemplified by the line of tungsten carbide, boron carbide, and diamond tipped tools shown above. These New England Carbide products represent a wide range of tools and parts to cover your standard or special requirements.

When you think of precision production, think of precision New England tools and parts, because every one is checked and double checked to specified tolerances. *If it can be tipped, New England can do it—exactly!*

Mail the coupon today for complete information on the New England precision line.

NEW ENGLAND CARBIDE TOOL COMPANY

Without obligation, please send me further information on the items checked below.

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COMPANY _____

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CITY _____ STATE _____

A.M.

60 BROOKLINE ST., CAMBRIDGE 39, MASS.

draulic Rigidmil. In addition to a complete list of specifications and dimensions, examples of milling jobs performed on the machine are included.

(941) Tungsten Electrodes

Callite Tungsten Corp. has issued a new bulletin designated as **No. 154** describing the application of Callite tungsten electrodes by Atomic Hydrogen, Helium, and Argon Arc Welding. It also gives complete data on Callite tungsten electrodes available, together with the physical properties, dimensions and current range in amperes.

(942) Brazing

Handy & Harman has issued a new instruction sheet for torch brazing with silver alloys. Designated as **Bulletin No. 12-A,** it discusses this type of brazing step by step with illustrations describing each operation. Points covered are fit of the joint, cleaning, fluxing, assembling, heating, applying the alloy, and flux removal. This same material also is available in the form of a chart for wall mounting.

(943) Punching

A new catalog illustrating and describing Wales Type "AA", "C", "CA", and "Z" Hole Punching Units, is announced by Wales-Strippit Corp. It also describes set-up methods, how to reduce press down time, and template mountings on stamping presses. The publication is designated as **Catalog C.**

(944) Tapping

Bakewell Manufacturing Co. has issued an excellent booklet called **Facts About Precision Tapping You Should Know.** The book discusses precision cut threads, outlines their advantages, describes how machine screw threads are cut to strict specification, and describes methods of tap control.

(945) Tool Maintenance

Devoted to war-time maintenance, care, and operation of portable electric tools, a new manual, **How To Get the Most From Your Portable Electric Tools,** has been issued by Skilsaw, Inc. The book also carries complete data and working illustrations of Skilsaw Portable Electric Tools.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 179.

(946) Metal Saws

Designated as **No. 43-S,** a new general catalog issued by Clemson Bros. Inc. gives technical data on metal sawing operations together with information on proper selection and use of the company's hack saw blades on different kinds of metal and at different speeds.

(947) Cutting Tools

Carbide Tools, Blanks and Specialties. 40 pp. Kennametal, Inc. This book is divided into three sections dealing with the company's standard and typical tools and general information. Included also are tips on preventing grinding cracks, brazing blanks to tool shanks, and milling steel with tipped cutters. Also the book contains instructions for grinding Kennametal tools.

(948) Metal Coating

Mogul Metallizing. Metallizing Company of America. This new 40-page catalog deals with all phases of the metalizing process. It contains a number of illustrations of metallizing application and includes complete specifications and engineering data. The equipment section of the book deals with the Mogul Electric Bonder and the Mogul Link for simplifying arc welding, and describes the company's other metal sprays.

(949) Gages

Millionth of an inch for sale by Vinco. This 4 color, 16-page booklet, excellently done, illustrates and describes gages and inspection tools. Separate pages are devoted to plain cylindrical gages, straight-side spline gages, thread ring gages and masters, serration spline gages and masters, involute spline gages and masters, Vinco master gears, Vinco gear rolling machines, optical master inspection dividing head, master involute checker, Vinco spline and gear grinder, and angle to radius dresser.

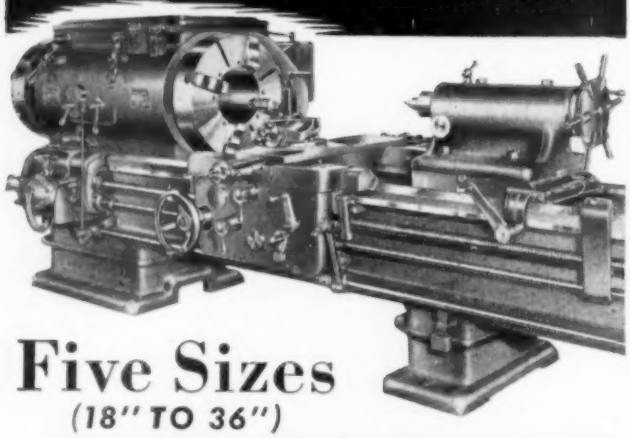
(950) Screw Machines

On-the-Job Instruction of Screw Machine Personnel. Published by The

(Concluded on page 210)

HYDRATROL LATHES

Large Hollow Spindle Type



Five Sizes

(18" TO 36")

Provide Wide Range of Usefulness and Efficiency!

Lehmann MACHINE CO.

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Specify HILCO HYFLOW OIL FILTERS

HILCO Hyflow Oil Filters are used for filtering all types of industrial oils such as used for cutting and lubricating. Units are available for stationary use or portable operation for moving from one machine tool to another.

By keeping cutting and lubricating oils in good condition, oils are kept in service for an indefinite time and result in less down time, longer periods between tool grindings and better finished work. This means increased production.

★ Write today for free literature and see what Hilco operators are doing – then let us help you select a Hilco to take care of "That Particular Job."

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THE HILLIARD CORPORATION

107 W. FOURTH ST. ELMIRA, N. Y.

To Get Better Metal Working Production

See What Others Have Done With Special Machine Tools!

Production line of W. F. and John Barnes Center Column Machines tooled specifically for the machining of armor piercing projectiles.

GET THESE FREE BOOKLETS

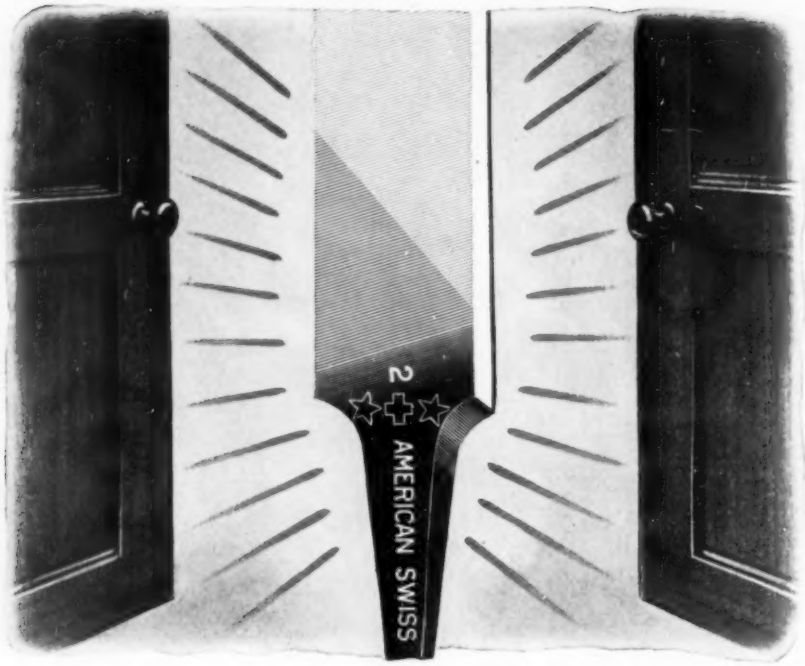
● Here is a set of five new bulletins which illustrate and describe an unusual variety of metal working production solutions. Machining operations include boring, facing, drilling, reaming, milling, honing and tapping. Each machine represents an economical solution of a problem involving one or more of these operations. Deep-hole drilling machines, Unit-type machine tools performing multiple operations, and boring and honing machines are but a few covered in these five bulletins. Machines for low, moderate and high production requirements are also included. These booklets may give you an idea for a more profitable approach to *your* metal-working problems. Write for them today. Ask for bulletins 144.

★ ***HOW YOU CAN GET A SPECIAL MACHINE TOOL TO SUIT YOUR JOB*** is illustrated and described in this set of 8 bulletins. Each bulletin traces a machining problem from the preliminary survey to the final machine design. Each may suggest a more productive tooling set-up that you can use today. Write for bulletins J4.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.



Gentlemen,
meet the **FINISHING FILE**

A SWISS-PATTERN FILE FOR *GENERAL* WORK . . .

This type of Swiss-Pattern file should be a recognized and valued friend to you, because of its helpfulness in many kinds of general filing work. However, we find that its usefulness is not as widely known as that of other types of Swiss-Pattern files, so we are directing your attention specifically to it.

The Finishing (or Stripping) File is really a big brother to the Pillar File, for it has the same rectangular section and parallel width, with double-cut sides and safe edges. Its comparatively heavy proportions and its large sizes (8 in., 10-in. and 12-in. lengths) make it particularly suitable for general filing and on lathes.

When used for such work, "American Swiss" Finishing Files are far superior to ordinary files, because their tough strong metal and uniform hardness make them cut faster and last longer. So, gentlemen, you will find it well worth while to become acquainted with the "American Swiss" Finishing File . . . obtainable from our Distributor.

FREE CATALOG
SENT ON REQUEST

American Swiss File & Tool Co. Elizabeth, N. J.

ASK FOR THEM BY NAME

American Swiss

SWISS PATTERN FILES

—NEW LITERATURE—

National Screw Machine Products Assn., this training manual presents instructional material covering all types of multiple spindle automatics. Also, the Brown & Sharpe 14-booklet series is cross-indexed to the Association's suggested training method. In addition to discussing functional machine operation, the Manual includes extensive data on grinding and setting tools and comprehensive trouble charts.

The approach used by the book represents a return to the pre-war method of training, namely, instruction on-the-job and at the machine. Training, however, is broken down in step-by-step procedures for each fundamental in setting up and operating. Cams, gears, stock loading, and similar operations are separated, making it possible to specialize and instruct in partial setting up and operating, releasing a few highly-skilled operators and set-up men for more intricate matters such as tool setting and adjustment.

INFORMATION FREE
To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 179.

(951) Management
Solutions to some Executive Problems. This new book, published by Pioneer Engineering and Manufacturing Co. is especially designed to give executives valuable suggestions in approaching production problems.

It deals with specific phases of management, such as increasing production, lower costs, establishing labor harmony, taking the kinks out of production, improving quality and meeting special problems. Copies will be sent to any executive if request is made on company stationery.

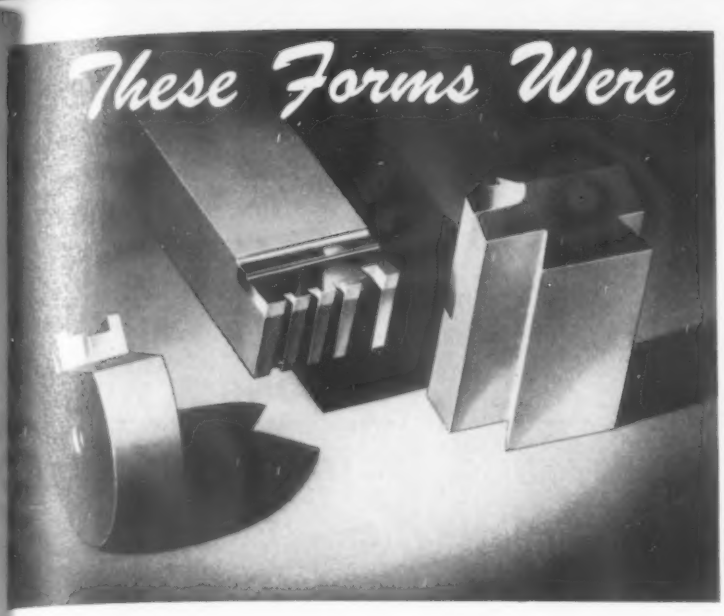
(952) Cutting Tools
U. S. Tool & Mfg. Co. have just announced a 60-page special tool hand book including illustrations and mechanical drawings of high-speed steel cutting tools, milling cutters, forming tools, end mills, reamers, counter-bores, back-off, gang, and many types of miscellaneous special tools.

Bound with a ring binder so that it will lie flat, it is useful for figuring out the kind of specialized cutter that may be used for a particular job. Included are mechanical drawings in which dimensions have been left off so that the user may fill them in to suit his own special requirements.

(953) Taps and Dies
Winter Brothers Co. has just issued a new catalog and hand book listing various tap and die lines made by the company and containing a section on tapped hole sizes together with useful information and tables as adopted by the Institute of Tap and Die Manufacturers. An excellent feature of this book is that it is indexed and cross-indexed enabling the reader to find what he wants in the shortest possible time.

Because of the expensive nature of the publication, it is necessary that all requests be on the company letterhead of the person making the request.

THE END



FINISH GROUND

From The Rough

and Checked

In One Setting

WITHOUT REMOVAL

From the

Wickman

PROFILE GRINDER

THE Wickman Profile Grinder provides a method of grinding in which a fifty times size layout of the form, a pantograph system, microscopic inspection, and a universal grinder are coordinated to provide profile grinding to an accuracy within ±.0005″. Because of the extremely accurate method by which the profile is transferred directly from the drawing to the part, no further inspection or checking of the part is necessary. Before the part is removed from the machine, the profile which was ground is known to be correct.

In the grinding of a wide range of regular or irregular shapes including those ground in tungsten-carbide, the Wickman Profile Grinder has reduced machining time to approximately one-fourth that required by usual methods.

With an average amount of profile grinding work in your plant, this machine can make possible extremely worthwhile production savings. Let us send you full information.

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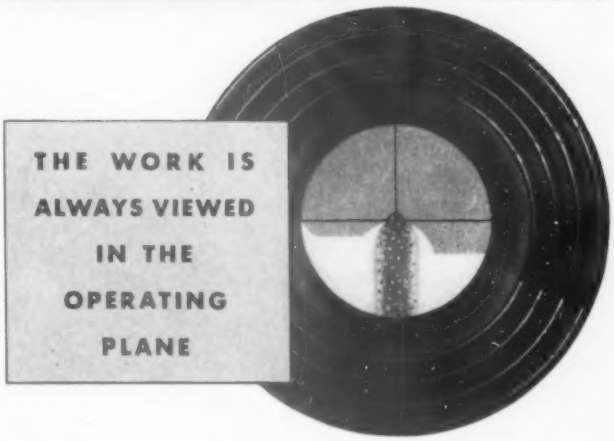

THE WORK IS ALWAYS VIEWED IN THE OPERATING PLANE

WICKMAN PROFILE GRINDER

THE Wickman CORPORATION

15535 WOODROW WILSON AVE.
DETROIT, MICHIGAN

Atlas

MULTIPLE-SPINDLE

DRILL PRESS

When minutes are precious as they are right now, whole days of production can be saved each month by using Atlas Drilling Machines on parts that require a series of drilled and tapped holes. These inexpensive, efficient machines have massive production oil tables; solid type iron legs. Drilling heads are Atlas 4 SKF ball bearing floating-drive design with new crank-type head raising mechanism.

Investigate the speed-up possibilities of Atlas Drilling Machines. They are setting new operating records in many of the nation's largest plants. Atlas Press Company, 114 North Pitcher Street, Kalamazoo, Michigan.

ARMY NAVY

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Tools For Straight Holes; Concentric Angles, Flats and Contours

Also Combinations of These In One Tool

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"HOLE" ENGINEERING SERVICE

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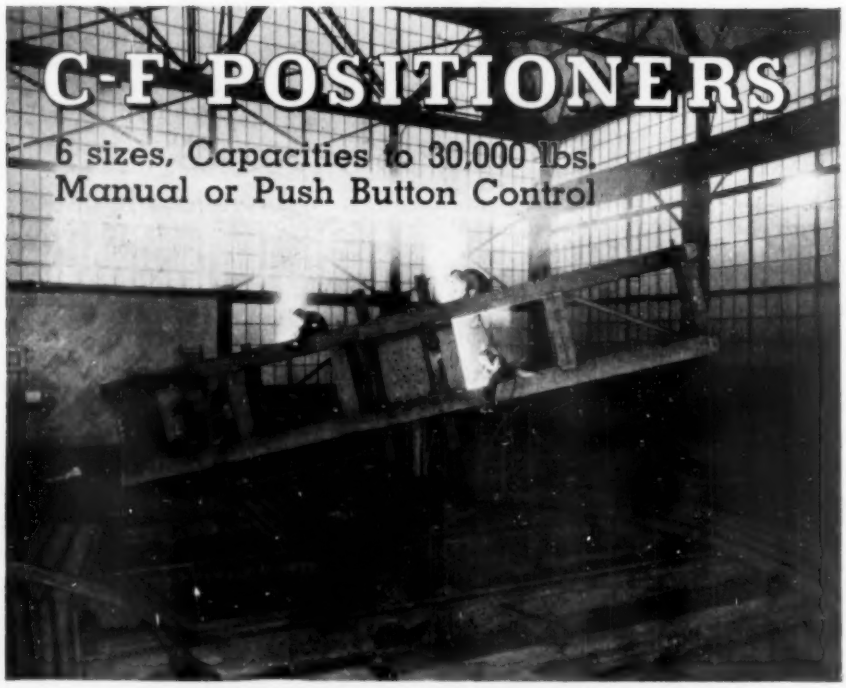
C-F POSITIONERS

6 sizes, Capacities to 30,000 lbs.
Manual or Push Button Control



The extra strength built into C-F Positioners enables them to withstand the extreme side thrusts and torsional strains met in positioning cumbersome or unbalanced loads — Coupled with the C-F *pedestal mounting* and adjustable height features, this extra strength increases the range of work handled, makes each C-F Positioner the most versatile tool in its capacity. *You can do more work with C-F Positioners.*

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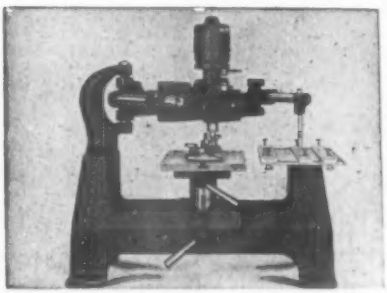
CULLEN-FRIESTEDT CO. • 1318 S. Kilbourn Ave., Chicago 23, U. S. A.



For Pantographic Marking

ENGRAVING
ACID ETCHING
ELECTRIC ETCHING

This machine does all three

A compact precision bench-type pantographic machine, with interchangeable heads . . . for engraving instrument dials, name plates, etc. . . . and for acid etching or electrically marking tools and parts—heat-treated or annealed—on flat, concave, or convex surfaces.

Illustration shows machine with engraving head attached.

Write for Literature

H. P. PREIS ENGRAVING MACHINE CO.

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How to Get the Most Economical Solution to Your Milling Production Requirements....

SUNDSTRAND ENGINEERS Can Solve It with One of these 3 Practical Answers

1 Standard Rigidmils with Fixtures and Tooling to Suit Your Work

When possible, milling production problems are solved most economically by standard Rigidmils using standard attachments or simple fixtures and tools to suit the work. Next most economical solution is...

(Left) Standard Rigidmil with simple hand clamp fixture for continuous milling valve tappet guides.

2 Standard Rigidmils with Special Heads and Tooling

All Standard Sundstrand Rigidmils are designed to accommodate the application of a wide variety of special heads and tooling. Consequently, an unlimited number of milling production problems can be solved with special arrangements of standard Rigidmils. When not economical to do this, our engineers can design...

(Left) No. 1 Rigidmil with special 2-spindle head and automatic index base for milling clutch teeth.

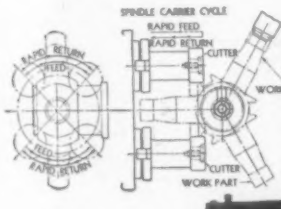
3 Entirely Special Machines

These machines are designed only when the required production cannot be obtained most economically by either of the foregoing methods.

(Left) Automatic Milling Machine for milling oil groove in 12 different sizes of bearings—both plain and flange type.

Planetary Milling Flanges

Part—Propeller Spider.
Operation—Planetary milling flanges on each of three arms.
Machine—Sundstrand two-spindle planetary milling machine mills two circular surfaces around each arm of the Hub Spider. Surfaces were formerly milled one at a time on a single spindle machine. Machine has manually indexing fixture which permits machining all surfaces without relocating the part.



Get these Free Booklets or Call in a Sundstrand Production Engineer

These free booklets cover the entire range of Sundstrand standard Milling Machines. Write for them today. Ask for Bulletins 820. If your problem cannot be met with these standard millers, our engineers will be glad to assist in the designing of a special machine to do the job economically. Call on them without obligation.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

ARMY (E) NAVY

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2532 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

HANDY ANDY *Says*—

T.M. REG. U.S. PAT. OFF.

FOR ONCE (or, as usual, either way you'll have it) the Column may read like the ravings of a rambling wreck. Because, I'm trying to write with the portable propped on a pillow between my knees, all a/c a kickback from the indisposition(?) that laid me up a few weeks back.

All my own fault; should have holed up when I felt it coming on. But, it's like Doc said: "I've more engineers and industrial executives on my hands than all the rest put together. They stretch the limit to the breaking point."

Well, we can't relax in strikes and slowdowns, can we? Or should we?

However, that's all incidental to the theme(s) which, I hope, will develop as I go along. Having had time for prospect and retrospect, as well as introspect, anything may pop to mind. Too much!

Besides, there have been diversions. Scattered around the bed, to the utter flabbergastion of the Missus, is an atlas, a battered field glass, the current magazines and a volume on rifles. Also, a catalog of old guns, given me by Ade Potter, and the sun is shining and it could be worse.

Anyway, the deadline looms and the show must go on, and fortunately, the spirit is rarin' to go even if the flesh is slow to respond.

In a distant field, but brought close through the glass, boys play at war, a game ever glamorous to "golden youth." Reminds me that the Spanish-American war broke shortly after I came to America, soon, every vacant lot had become the site of a juvenile fort.

▲ ▲ ▲

A green Swede in an Irish neighborhood, I was forced into the unwilling role of a Spaniard, became a target for B.B. shot and arrows. One exuberant young Mick blasted a chunk of tow from behind an ear with a cat-scat torpedo.

But that was too much! I made me a sword from a bar of tire iron, then, arrayed in a horned helmet a la Viking and with the lid of Mother's wash boiler for a shield, I charged the worst of my tormenters. Oh, there's nothing like cold steel! As a result, I was immediately "naturalized" and thereafter fought on the side of the "Yanks".

Well, America was considered a rookie in the league of world powers back in '98, but, she's come a long way since then.

Now, we are unquestionably the most powerful nation on earth, with only Britain, China and Russia as potential contenders for first place. For Britain is no longer an empire, as we have known that term, but a commonwealth of nations, each enjoying practical autonomy. Yet, the weft of union is undoubtedly stronger than the intangible ties that held together the far flung empire.

▲ ▲ ▲

And fortunately, our ties with the British are henceforth to be indissoluble, the unwritten covenant of peace symbolized by the long, unfortified frontier separating us from Canada.

China, long exploited by the West and with much to forgive, is nevertheless destined to be our friend. For China's ageless civilization has been reared on peace, and her future greatness is to be achieved through the intellectual and economic emancipation of her teeming masses. The West can help immeasurably in her reconstruction, taking its reward in broadened, reciprocal markets and in the friendship of a splendid people.

▲ ▲ ▲

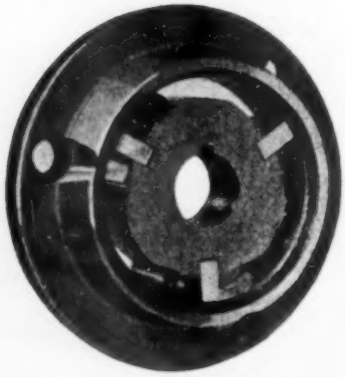
As for Russia, she will be a serious contender in the post-war world. Let there be no illusions on that score. And, she may force peace terms to which her Allies may have to reluctantly agree.

For there are small nations that, having enjoyed a brief freedom until Hitler

(Concluded on page 216)

A FIXTURE LOCK TO SUIT YOUR REQUIREMENT

LEFT HAND LOCK
COUNTER CLOCKWISE



RIGHT HAND LOCK
CLOCKWISE

LOCK FOR
BOTH DIRECTIONS

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RANSOME WELDING POSITIONING EQUIPMENT

Now... HANDLED THROUGH WORTHINGTON DISTRICT OFFICES

The equipment that saves welders' time and energy and increases welding production by making it easy to shift work at will ...can now be obtained through Worthington Pump and Machinery Corporation District Offices and representatives in 36 cities.

With a Ransome Welding Positioner, many jobs can be done in one pass that used to take several, because the seam is always where it should be, in position for downhand welding. Result: smoother, stronger welds, more output with less effort.

There is a Ransome unit for every welding job.

Get in touch with the nearest Worthington office or representative

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BALTIMORE	DALLAS	KANSAS CITY	PORTLAND, ORE.	SPRINGFIELD, MASS.
BIRMINGHAM	DENVER	LOS ANGELES	PROVIDENCE	SYRACUSE
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BUFFALO	EL PASO	NEW ORLEANS	ST. PAUL	WASHINGTON, D. C.
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Ransome WELDING POSITIONING EQUIPMENT

Industrial Division

RANSOME MACHINERY COMPANY, Dunellen, New Jersey

WP 4-1

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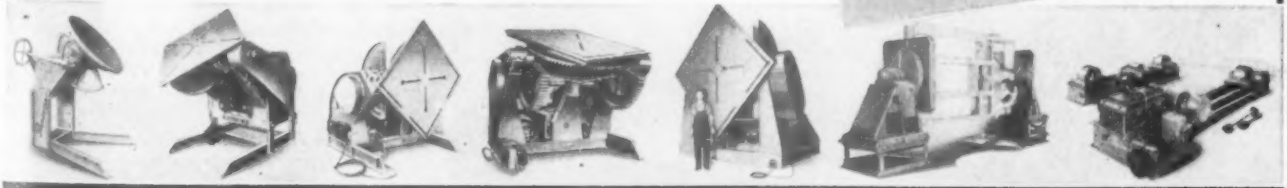
Power Plant Equipment • Turbines & Turbo Generator Sets • Diesel & Gas Engines • Pumps and Compressors • Air Conditioning & Refrigerating Equipment • Construction & Mining Machinery • Power Transmission Equipment • Liquid Meters



Capacities 500-lb. to 40,000-lb., hand-operated and motor-operated . . . Head-stocks and Tail-stocks . . . Turning Rolls

A STEEL KNOT
ACTUAL PHOTOGRAPH
Speed Treat Steel (.45 carbon) 1-inch cold drawn bar tied in a knot, cold, without fracture.
SPEED TREAT STEEL
A MEDIUM HIGH CARBON-OPEN HEARTH PRODUCT
ONE STEEL that gives you
1 Excellent machinability
2 Greatly extended tool life
3 Good finished parts
4 High physical properties
5 Excellent impact resistance
6 Good torsional values
7 Minimum distortion
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SPEED TREAT STEEL—Use this ONE steel in place of the several comparable steels you are now using. You'll save time, tool life and money per ton used. Machinability is 170 S.F.P.M. PLUS excellent impact resistance, torsional values, minimum distortion and heat treatability. WRITE US FOR DETAILS... OUR METALLURGISTS ARE AT YOUR SERVICE
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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

—HANDY ANDY Says—

(Concluded from page 214)

changed the order of Europe "for a thousand years", are now destined to come again under Russian domination. For might, whether right or wrong, is might regardless.

▲ ▲ ▲

I see by the papers where a sports writer deplores the unsportsmanlike attitude of present day Nimrods. They haggle over kills, vie to get there first with the tags and steal carcasses unless padlocked. And, they shoot at anything that moves!

Well, 'twas not ever thus. I recall that, as a 'teen ager, I went shooting with a couple of friends. Both fired simultaneously at a duck, which fell. Each waived all claims, insisting it belonged to the other. Finally, they put it up to me. "Both of you shoot at the next duck," I said, "and each take one." Incidentally, almost every boy of my acquaintance had a gun and had been trained in its use.

▲ ▲ ▲

I recount this because our pacifists have been inclined to discourage the use of firearms among American youth. (They're learning now, eh?) Not, for that matter, that I'm a particularly keen advocate of the hunt, although considered a fair shot until bifocals blurred the sights.

Rather, I've found the greater enjoyment in tramping the woods and in the feel of a good gun, even as I am fascinated by the mechanisms of various arms. It's a good, clean hobby, good for the individual in promoting sportsmanship and self reliance, and good for a nation.

▲ ▲ ▲

When this war is won, we may have learned that our security is best insured by a knowledge of arms and the virile manhood that compels respect for peace. That is, until the world as a whole subscribes to a comparatively new and largely untried philosophy, that international differences be settled by jury, not by mass slaughter.

Then, and only then, may we preach universal disarmament. For, except as individual heroism keeps its fiction alive, the glamour of war went out with the mass bombing of civilians. Modern invention has made war too terrible for future consideration. But for the present, we can only impress that fact upon the enemy who started it.

MAGIC WITH MIRRORS

●

Plastics broke into the news recently with the revelation that ordnance contractors were using inexpensive plastic bullets in testing guns.

Now, believe it or not, guns are being tested without ammunition of any kind. Colonel D. N. Hauseman, chief of the Philadelphia ordnance district, has announced the development of a new optical instrument which permits test-sighting of Garand rifles with mirrors and without firing a shot.

The Ordnance officer says 13 rounds of ammunition, formerly used in testing each Garand, will be saved by the new "dry-firing" method.

America is getting on with the war, and it's more important than ever to avoid tool wastage!

Don't scrap a High Speed Tool before it has given maximum production. Many of your used cutters can be reconditioned or converted into special tools. We are specialists in this type of service, with 30 years of experience.

When you let us prolong the life of such valuable equipment, you not only conserve vital steel but you also save the man-hours necessary to make new tools. Certainly it is an effective way of helping the war program.

Let us demonstrate a startling fact: That your tool cost can be cut 50%, with deliveries so rapid that they are made in a matter of days. There is no obligation.

DON'T SCRAP THOSE TOOLS--

--KEEP 'EM PRODUCING!

A COMPLETE RECONDITIONING SERVICE FOR TOOLS

NEW MILLING CUTTERS FROM OUR STOCK OR YOUR OWN STANDARD CUTTERS CAN BE QUICKLY CONVERTED TO SPECIAL CUTTERS

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A. S. T. E. DOINGS

• National Headquarters of the American Society of Tool Engineers: 2567 West Grand Boulevard, Detroit 8, Michigan. Telephone, TYler 5-0145. National Officers (term of 1943-1944): President, Ray H. Morris; 1st Vice-President, Douglas D. Burnside; 2nd Vice-President, C. V. Briner; Secretary, Earl V. Johnson; Treasurer, Floyd W. Eaton; Executive Secretary, Adrian L. Potter.

• For application blanks and information pertaining to membership in the American Society of Tool Engineers, address the Secretary's office, 2567 West Grand Boulevard, Detroit 8, Michigan. Senior initiation fee is five dollars. Dues, eight dollars per year for senior grade membership, and five dollars per year for junior grade membership. Junior initiation fee is two dollars.

Atlanta: H. P. Berry, Milledgeville, Ga., was principal speaker at the Nov. 3 meeting held at the Lakemoore Country Club. Fifty-five members attended.

Mr. Berry spoke on "cutting tools". His lecture was accompanied by movies presented by the Aluminum Co. of America.

Binghampton: Eighty-five members and guests attended the Nov. 3 meeting at Hotel Sherwood.

Chapter members who served as speakers at the technical session were Ralph Stecker, Roger Coles, Roland Andrews, Mr. Dotsko, Al Mack, William Ring, and William Mazar.

The technical speaker at the Dec. 11 meeting, held at the Arlington Hotel, was Dr. Nathan H. Gist, of the National Association of Manufacturers. His address was "Final Test of Democracy."

Boston: Feature speaker at the Dec. 9 meeting held at Schrafft's Restaurant was A. A. Cambria, chief engineer of LaPointe Machine Tool Co. His talk, illustrated with slides, stressed rapid development in the field of broaching.

He demonstrated many of the fixtures developed by LaPointe Co. for particular jobs, and outlined tremendous developments expected after the war in the broaching field.

Buffalo-Niagara Frontier: D. T. Wellman, chief of production control, Dow Chemical Co., was principal speaker at the Nov. 18 meeting held at the Trap & Field Club. His subject was "The Working of Magnesium." His talk was accompanied by a sound movie on magnesium working.

Also on the program was J. Copeland Gray, director of industrial relations, Buffalo Arms Corp., who talked on "Human Engineering."

Central Pennsylvania: Speaking on "The Use and Application of Gage Blocks," Maurice Singer, representing the Philadelphia Doall Co., addressed the technical session of the technical session of the Nov. 9 meeting.held at the Engineering Society's rooms, in York Penn.

Chicago: The general technical topic at the Dec. 6 meeting, held at Huyler's Restaurant was "Light Metals." Representatives from the aluminum and magnesium industries on hand to discuss the features of their respective metals were Arthur Smith, Jr. representative of the Magnesium Division of the Dow Chemical Co., and I. H. Dawson and O. H. Jackson representing the Aluminum Co. of America.

Cincinnati: A joint meeting was held with the American Society of Mechanical Engineers at the Alms Hotel, Dec. 14. Principal speaker was Millard Romaine, assistant to the president of the Cincinnati Milling Machine Co. He talked on "Economic Development of Post-war Manpower Problems".

Cleveland: George Webber of Webber Gauge Co., made his initial announcement to the trade of his newest method in gauging, the angle gauge, at the Dec. 10 meeting held in the Hollender Hotel.

Mr. Webber explained that the angle gauge has been simplified so that 370,800 angles can be obtained by means of 14 angle blocks.

Also on the program was a talk by V. H. Ericson of Norton Co. He illustrated his talk with slides and motion pictures showing the proper use of grinding wheels and their methods of manufacture. A. M. Schmit, director of Region 9, and Adrian L. Potter, national executive secretary, were present.

Detroit: The annual Christmas party was held Dec. 9 at Saks Show Bar, Detroit.Four hundred and five members and guests were present at the party.

Erie: Nearly seventy A. S. T. E. members met at Erie Dec. 14 to organize the newest chapter, designated as No. 62.

The charter was presented by national vice-president C. V. Briner. He then administered the oath of office to the following. Chairman—John C. Wilcox, tool service engineer, Walter J. Greenleaf Co.; First Vice-Chairman, Robert O. Johnson, chief engineer, Johnson Metal Products Co.; Second Vice-Chairman—Homer D. Gage, chief tool designer, McCrosky Tool Corp.; Secretary—Harold E. Spencer, tool designer, Lord Mfg. Co.; Treasurer—Harold W. Hagle, special assignments, General Electric Co.

National Secretary Earl V. Johnson and Regional Director William J. Gamble assisted Mr. Briner in chartering the chapter.

Fond Du Lac: Carl Taylor, executive vice-president of the Wisconsin Building and Loan League, was principal speaker at the Dec. 17 meeting, held at Hotel Retlaw.

He compared ideas and forms of organization of American problems with

(Continued on page 220)

Front row: Officers of new Erie chapter, chartered Dec. 14. Left to right: John C. Wilcox, chairman; Harold W. Hagle, treasurer; Robert O. Johnson, first vice-chairman; Harold E. Spencer, secretary. Back row; left to right: William J. Gamble, director, Region 8; C. V. Briner, 2nd national A.S.T.E., second vice-president, and Earl V. Johnson, national secretary.

FORGING
IS
BASIC
The forging of metal parts is and always has been the basic process in mechanical progress, whether in peace or in war.
Utmost strength and toughness with minimum weight is attained only in drop forging—more properly termed "impact die-forging." For it is the impact of the blow of the upper die on the hot metal resting in the lower die that gives to that metal the improved physical properties that fit it to withstand "unpredictable" loads and stresses.
Modern drop hammers—Chambersburg Hammers—have been responsible for the great progress in drop forging through (1) precision of operating mechanism, (2) increased ram velocities and (3) increased anvil-to-ram weight ratios.
Thus to the basic importance of forging has been added the refinement of scientific hammer design and manufacture.
Chambersburg Engineering Company
Chambersburg, Pennsylvania
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CHAMBERSBURG
HAMMERS · CECOSTAMPS · PRESSES

those existing in other nations. Also on the program was a sound film "Petroleum and Its Uses in The Home," presented by the U. S. Bureau of Mines."

Fort Wayne: Principal speaker at the Dec. 8 meeting was C. A. Page of Pratt and Whitney Division of Niles-Bement-Pond Co. He spoke on "Dimensional Control." The talk, illustrated with slides, told the history of standards and covered modern gaging methods for the use of mechanical, fixed type, air and electrical gages.

Golden Gate: More than 100 members and guests turned out to hear Arthur Burgan, of the American Broach & Machine Co., at the Nov. 22 meeting at Engineers' Club.

Mr. Burgan gave an interesting and instructive talk on broaching, illustrating his discussion with panels showing various phases of internal and external broaching.

The annual Christmas Party was held at Hotel Claremont in Berkeley Dec. 7.

Greater New York: Technical speaker at the Dec. 6 meeting in the Grand Ballroom of the Hotel New Yorker was Peter F. Rossman, general manager, Development Division, Curtiss-Wright Corp. He spoke on "Application of Mass Production Methods to Aircraft Manufacture." He pointed out parallels in the tooling and plant layout problems in the automotive and aircraft industries.

Hamilton: H. M. Huffman, representing the Cincinnati Milling Machine Co., addressed 136 members at the Nov. 12 meeting held at the Iroquois Hotel, Galt, Ont. His talk, illustrated by slides, was on "Cutter Sharpening Practice."

At the Dec. 10 meeting, held at The Welland House, St. Catherines, Ont., L. R. Twyman, manager, Machinery Production Div. of Vickers, Inc., spoke on "Hydraulics in Machine Tool Control and Fixture Operation."

Houston: Approximately 100 persons attended the Nov. 16 meeting to hear A. F. Hasty, Detroit district manager of Sunnen Products Co., give an interesting talk on application of honing to war production. Mr. Hasty's talk, illustrated with slides, was of particular interest to the chapter, since a very limited amount of honing has been done in that particular district.

Indianapolis: The main speaker of the Dec. 2 meeting, held at Hotel Lincoln, was Larry W. Lang of the National Tool Salvage Co.He talked on "Tool Salvage." Illustrative slides were shown illustrating the results of tool salvage.

Kansas City: Representatives of the Savage Tool Co. presented talks on "Theory of Gauge Blocks and Precision Instruments," and "Optical Flats and Monochromatic Light," at the Dec. 1 meeting held at Fred Harvey's Pine Room in the Union Station.

Coffee speaker at the meeting was Burton O. Heinrich, Oldsmobile Division of General Motors, who spoke on "Shearing Steel Blanks for Steel Cartridge Cases."

Lakehead: Showing of three films featured the technical session of the meeting held Dec. 10 in the Legion Hall at Port Arthur, Ont.

The Carborundum Company presented one of the films, entitled "The Use of Carborundum in Grinding". The picture gave a clear explanation of the action of different types of carborundum abrasives and their uses with respect to various kinds of grinding. The second film, shown through the courtesy of the Canadian Electric Company, explained the meaning of frequency modulation and its effect on the radio industry. The third picture showed a behind-the-scenes view of what television is and does.

Little Rhody: Principal speaker at the Nov. 29 meeting, held at the Wannamoisett Country Club, Rumford, R I., was E. W. Vaill, technical representative of the Bakelite Corp., who spoke on "Modern Plastics." His talk was accompanied by slides and a technicolor sound film. Another film "Electronics At Work," also was on the program.

Montreal: L. S. Martz, representative of Micromatic Hone Corp., was principal speaker at the technical session at the Dec. 8 meeting held at the Windsor Hotel.He spoke on the develop-

(Continued on page 222)

1913 FOR THIRTY YEARS 1943

MANUFACTURERS OF PRECISION CUTTING TOOLS

• TODAY: Our entire output is being supplied to manufacturers making war materials.

• TOMORROW: We look forward anxiously to the post-war period when again we can supply industry with "Tools of Distinction."

★ TWIST DRILLS, CENTER DRILLS, REAMERS, COUNTERBORES, AEROMATIC DRIVES, PILOTS, AND COUNTERSINKS ★

COGSDILL TWIST DRILL CO.

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★ LET US ENGINEER YOUR DRILL AND REAMER PROBLEMS ★

POSTWAR PREVIEW

AUTOMOBILES—Costs after the war will be higher due to lowered production rates and increased wage scales.

Something can be done . . . INCREASED PRODUCTION . . . with less manpower.

YODER ROLL FORMING MACHINES are designed for laborsaving ease of operation and efficient quality production.

THE CHANGING OF ROLLS is a matter of small moment compared with the laborious unfastening, complicated adjusting and the reassembling of obsolete types of roll forming machines. This is just one of the features exclusive with Yoder.

GREATER PRODUCTION OF QUALITY PARTS can be rolled out on a Yoder than on any other machine of similar type or by any other method. Yoder has pioneered in the development of roll forming machines and many satisfied customers have said, "You get the latest improvements from Yoder." Roll forming is superior to other methods in that STRENGTH is added to parts; CHEAPER base metals can be used; MACHINING is reduced or eliminated.

YODER Roll Forming Machines are THE machines of the hour! Let them help you. Write to us.

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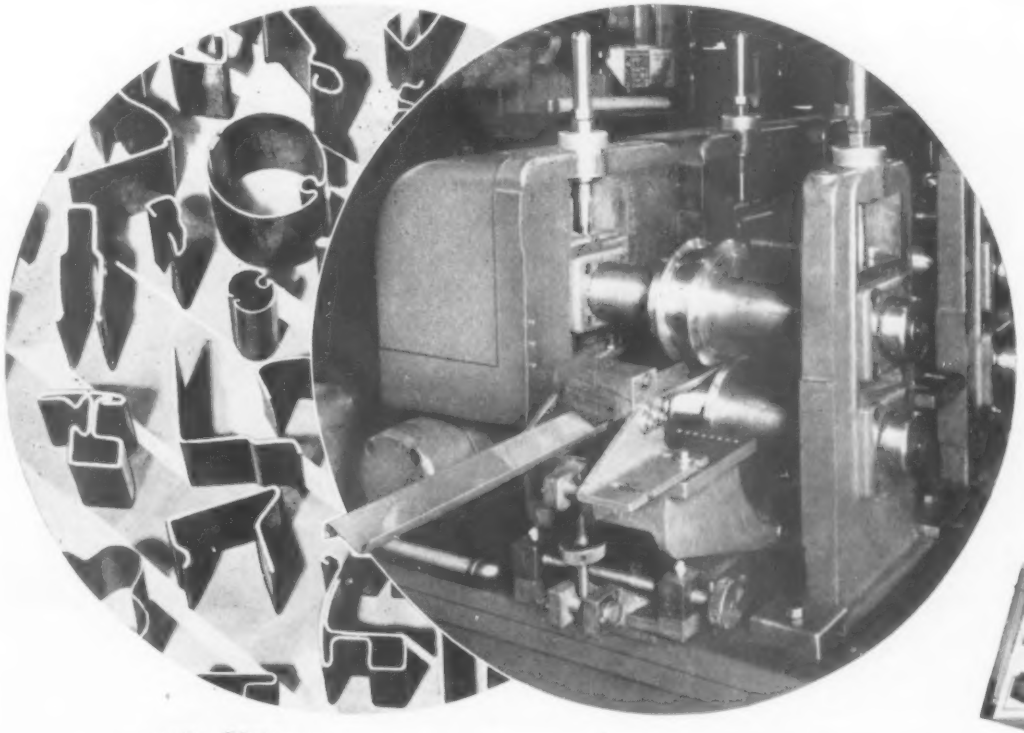

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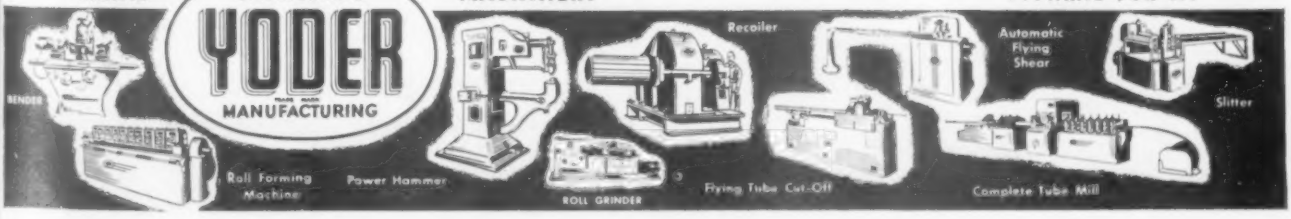

ment and modern application of the honing principle.

He discussed abrasive stones, cutting action on various metals, coolants, speeds, and similar subjects. His talk was accompanied by the showing of a sound film entitled "Background, Theory and Progress of Honing."

New Haven: J. B. Wilkie, gauge sales engineer for Pratt and Whitney, was principal speaker at the technical session of the Dec. 9 meeting held at the Duncan Hotel. He talked on "Modern Gauging Practice." Following the address, which was illustrated with slides, a large number of questions were asked. Attendance was 87 members and guests.

New Orleans: Keynote speaker at the Nov. 18 meeting held at Jung Hotel was Capt. William Nelson, district manager of the New Orleans Division of Consolidated Vultee Aircraft Corp. He gave a talk on post-war aircraft prospects and the role that tool engineering will play.

Also on the program was an address by Wayne Scott, chief tool engineer for Higgins Engine Co., Inc., who spoke on carbide cutting tools, illustrating his address with slides.

North Texas: Lester Detterbeck, design engineer for George L. Detterbeck, Inc., addressed the Dec. 17 meeting at Blackstone Hotel in Fort Worth. He spoke on "Design and Manufacture of Form Tools and Cams for Automatic Screw Machines."

Peoria: With 250 persons present, the largest meeting yet held from point of attendance was held in Hotel Jefferson, Nov. 2.

Principal speaker at the technical session was T. R. Lawson, electronics engineer for Westinghouse Electric Co., who spoke on "Electronics at Work." He also demonstrated a Westinghouse product, "Mot-O-Trol."

Philadelphia: Two technical speakers featured the program of the Nov. 18 meeting held at the Engineers Club. Maurice A. Singer, president and general manager of the DoAll Philadelphia Co., spoke on "Gauge Blocks and Precision Instruments," illustrating his talk with two sound films and by charts. Also on the program was an address by John J. Tagert, chief of inspection, Ammunition Branch of the Philadelphia Ordnance District.

Coffee speaker at the annual Christmas party, held December 16 at the Engineers Club was E. W. Lafferty, chief of production engineering div., Philadelphia Ordnance District.

Pittsburgh: Arch Lundbye, chief engineer for the Crowell Collier Publishing Co., was principal speaker at the technical session of the Dec. 3 meeting held at the Hotel Henry.

He talked on chromium plating as applied to cutting tools by the Lundbye Process. The speaker sketched the origin of his process from its inception in Denmark to the present time.

Portland: At a pre-organization meeting held Dec. 8, 27 members and ten guests assembled to lay plans for forming a chapter at Portland, Ore.

The group elected the following temporary officers: Chairman—Stanley Aldred, engineer for Willamette Hyster Co.; First Vice Chairman—Ray Edward Peterson, supervisor tool engineering at Columbia Aircraft Industries; Second Vice Chairman—Eugene Butzer, engineer for Iron Fireman Manufacturing Company; Secretary—Leo M. Butler, technical supervisor, Columbia Aircraft Industries; Treasurer—Paul Brong, owner and manager of Paul Brong Machine Works.

Arrangements have already been made for a meeting to be held Feb. 4, at which George Sanborn of the Fellows Gear Shaper Co. will speak on "Gears At Work," supplemented by a motion picture.

Potomac: L. R. Twyman, manager, Machinery Products Division, Vickers, Inc., was principal speaker at the Dec. 2 meeting held at the Mayflower Hotel. He spoke on "Hydraulics in Machine Tool Control and Fixture Operation." The talk was accompanied by slides.

Also on the program were Comdr. C. O. Glisson and Lt. Comdr. W. W. Timmis, both of the Naval Torpedo Station at Alexandria, Va. Two motion pictures, "What is Electricity" and "Electronics at Work," were shown through courtesy of Westinghouse Electric and Mfg. Co.

(Continued on page 224)

24-HR-A-DAY Operation

As one shift relieves another Gusher Coolant Pumps are ready to go . . . and keep on going. Simple design — fewer parts to wear — makes Gusher Pumps "steady performers." You get a copious flow of coolant when you want it and where you want it. There's a Gusher model for your requirements. Write.

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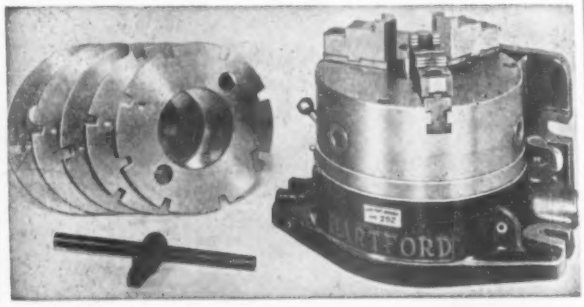
MODEL 9040—Available in any current characteristics, including 25 cycle, 1, 2, or 3 phase. Totally inclosed ¼ h.p. motor.

THE RUTHMAN MACHINERY CO.
1815 READING ROAD CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS



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are assured on all indexing jobs with the HARTFORD SUPER SPACER, even when you have to use inexperienced operators. This machine attachment is adaptable to milling, slotting, grinding, jig boring, drilling, and planing operations. It is complete with mask plates, self-centering chuck, reversible jaw, and chuck wrench.

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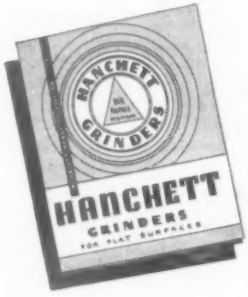
Surfacing Time Reduced 80%

BY HANCHETT No. 36 SURFACE GRINDER

Hanchett Vertical Multiple Spindle Rotary Grinder is equipped with two grinding heads instead of one. Work receives two cuts in one setting. Write for details.



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FORMER METHOD: Milling machine. Time required, 20 minutes per piece.

PRESENT METHOD: Castings are surfaced on a Hanchett No. 36 vertical Spindle Rotary Grinder. Time required, *4 minutes, or less,* per piece—an 80% saving in time over the former method.

This is a typical example of the manner in which Hanchett Grinders are daily saving valuable machine time and man-hours on countless vital jobs . . . If you are not getting desired results on some of your operations perhaps they can be performed better and faster on a Hanchett. "If it's a flat surface there's a Hanchett to grind it." — Rotary Table, Reciprocating Table, Traveling Wheel, Plano Cylinder Wheel and Disc Grinders. Consult our engineers—they will recommend the type of grinder best suited to the job.

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IN the sense that outstanding manufacturers from the four corners of the country come to McKinney for assistance this is in fact national headquarters for production tool engineering—and building too.

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Our organization of tool engineers and highly skilled craftsmen takes special pride in serving this kind of exacting manufacturers and derives a sense of satisfaction in making a substantial contribution to the country's amazing production accomplishments.

If you are looking for this kind of service we are confident of being able to serve you with the utmost satisfaction.

Write for explanatory bulletin or ask us to have a McKinney representative call.

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CLEVELAND
DESIGNERS and BUILDERS of PRECISION TOOLING
Since 1920
1671 ARABELLA ROAD
Tools·Dies·Jigs·Fixtures·Special Machinery

—A. S. T. E. DOINGS—

Rochester: Approximately 12[illegible] members attended the meeting held at University of Rochester Dec. 14.

V. H. Ericson, sales engineer of Norton Company was guest speaker. He presented an address accompanied by a colored motion picture film and slides on ways and means of increasing production and lowering costs through the use of the proper grinding wheel or wheels in tool and production grinding.

Also on the program was Major W. Schlotzhauer, chief of Miscellaneous Material Branch, Rochester Ordnance District, who outlined ordnance problems relative to gages and parts.

Rockford: One hundred members, together with their wives and friends, attended the Ladies' Night meeting held Dec. 9 at the Faust Hotel.

Featuring the program were entertainment by Dr. Howard Smith, musical numbers by an excellent ladies' orchestra, and presentation of a story, "Wings for Norway and the United Nations," by Mrs. Helen N. England.

San Diego: Speaker at the technical session of the Dec. 10 meeting, held at the Normal Heights Methodist Church, was G. A. Moudry, metallurgist for the Aluminum Co. of America.

Mr. Moudry's talk covered a brief technical background of the metallurgical changes that occur in aluminum alloys when subjected to thermal treatments, and embodied the treatments, practices and precautions necessary during heat-treatment operations. Also on the program were two sound motion pictures, "Aluminum, Mine to Metal," and "Aluminum Fabricating Processes."

Schenectady: Approximately 75 members and guests attended the meeting held Nov. 18 at the Elks Club.

A. B. Collins, sales manager for Federal Products Co., was guest speaker. Two color sound films on "Precision Measuring Instruments" were shown, explaining the principles of dial indicators in mass production.

Seattle: Principal speaker at the Nov. 16 meeting held at Crawford's Sea Grill was E. B. Fernhill, who outlined the early history of master plates from their beginning in Switzerland in the manufacture of watches. He pointed out some of the difficulties encountered in making master plates before jig borers were on the market.

South Bend: Dr. Marvin E. Mundel of Purdue University gave an interesting talk and led a discussion on motion and time study at the Nov. 9 meeting held at the Indiana Club. Also on the program was a talk by H. Wentzell who explained the functions of tool engineering for the benefit of guests.

At the Dec. 7 meeting held at the Oliver Hotel, Mr. Page of Pratt and Whitney discussed improved methods of dimensional control. He augmented his discussion with slides to explain more fully different types of gages.

Springfield: Eighty three members and guests attended the Nov. 8 meeting held at the Hotel Highland.

Coffee speaker was Joe Wright, chapter member who has been in

(Continued on page 226)

Your Post War Job Production Engineer

We are a manufacturer now engaged in war work, with over 35 years of successful experience behind us.

When the war is over, the production of quality peacetime products at a minimum of cost will be every manufacturer's problem.

If you have had a position the last several years with an aircraft or other manufacturer which has given you a broad production experience with new materials, new processes and new methods, we would like to discuss with you now the possibility of your joining our organization when V day comes. Let's get acquainted now to see whether your knowledge of manufacturing methods, sheet metal fabrication, welding, brazing, your education, etc., are what we will need.

Even though satisfied in your present position, the nature of the industry in which you are now employed may warrant your thinking of a permanent connection when peace is won.

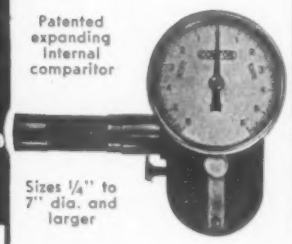
Replies will be kept in strict confidence. Our own employes know about this advertisement.

Write Dept. 100, The Tool Engineer,
2842 W. Grand Boulevard, Detroit 2, Michigan

"I can gage to a split-tenth with my COMTORPLUG"

For gaging bores to fractions of .0001"— COMTORPLUG

Patented expanding internal comparitor



Sizes ¼" to 7" dia. and larger

A gage that is widely used by final inspectors, yet is equally useful in the hands of relatively unskilled bench inspectors or machine operators — such is Comtorplug. Unique patented features assure self-alignment and self-centering, effecting automatic 2-point gaging to fractions of .0001". Not a passing reading. Shows not only size, but also detects any irregularities such as front or back taper, out-of-round, bell mouth, etc. Reaches to the very bottom of blind holes. A great aid in speeding quality production wherever precision bores are required.

Request Bulletin 29

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CUTTERS

for High Cycle Routing Shaping Milling

AT HIGH RPM

Inverted taper shank bit for use with patented Onsrud radial arm router taper chuck.

Straight shank spiral router bits. All types available.

Shaping cutter — can be supplied for any type and size of cut for operations such as beveling, chamfering, rounding, or slotting.

Special high speed steel side mill cutter.

Spiral shaping cutters for routers and shapers. Can be made up to your pattern design.

New 8" diameter Meehanite cast cutter with carbide tips, with 5° negative rake for horizontal milling of long nonferrous extruded beams and forged billets. Tip brazed on casting by high frequency induction heater.

It is now an admitted fact that the production machining of nonferrous metals is a field all its own. The problems encountered and the methods employed are in great part totally unrelated to ferrous metalworking.

For many years, designing and building nonferrous metalworking cutters as well as machines has been an Onsrud specialty. Our engineers have worked intimately with hundreds of plants helping to provide the practical means to faster, better nonferrous part production. This extensive and unusual experience is now at your service when buying the cutters you need.

Illustrated are a few of the hundreds of types and sizes of cutters and bits that are already standard at Onsrud. Cutters and bits, as well as Onsrud machines are available for milling, routing, and shaping such metals as the aluminum and magnesium alloys. Also available are cutters and machines for making the wood and composition patterns required in numerous modern metalworking operations.

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ONSRUD MACHINE WORKS, Inc.
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Onsrud MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

W-S Standard Reamers with Carbide tips. Tapered shank (illustrated) and straight shank types. Sizes: ¼ to 1½.

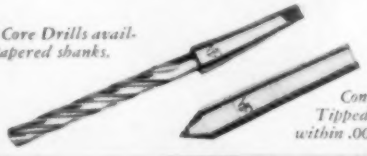
STANDARD REAMERS
available from stock

REAMERS and many other cutting tools formerly in the "special" class are STANDARD with us. The majority of these STANDARD cutters is in stock *most of the time.* Our broad line often enables the consolidation of tool orders and saving of valuable time. Each W-S tool is tipped with the correct grade of carbide to do the best possible cutting job on the metals for which the tool was ordered.

Carbide tipped tools are not just a specialty with us . . . we make them *exclusively.* You can *expect* and *get* uniform, high quality results with W-S tools. Write for new FREE Catalog 144 and latest prices. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI. Factory Warehouse: Long Beach, California.

SAVE TIME . . . wire or phone your requirements!

W-S Carbide Tipped Core Drills available in straight and tapered shanks. Sizes: ½ to 1½.



Concentricity of W-S Carbide Tipped Centers is guaranteed to within .0002" or less.

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REAMERS · CENTERS · CORE DRILLS · COUNTERBORES · TOOL BITS · SPOT FACERS
END MILLS · HOLLOW MILLS · ROLLER TURNING TOOLS · BORING TOOLS · SPECIAL TOOLS

—A. S. T. E. DOINGS—

Washington, D. C. with the Production Division Headquarters in the Army Service Forces. He gave an excellent talk on the outlook for future materiel procurement and on the accomplishments of the War Department.

At the technical session, Mr. Powers presented a talk on "U. S. Tool Co. Multi-Slide and Multi-Miller." The talk was accompanied by moving pictures and slides which covered most features of high speed blanking, and forming and milling.

St. Louis: Ralph F. Burns, representing the Metal Division of the New Jersey Zinc Sales Co., presented a film entitled "Die Casting" at the Dec. 2 meeting. The picture covered all phases of the die casting process from tooling of dies to the usefulness for die castings of zinc and other alloys.

Toledo: Dr. Charles Copeland Smith, representative of the national industrial information committee of the National Association of Manufacturers, spoke on "Sons of the Pioneers" at the Dec. 9 meeting held at the Toledo Yacht Club.

Toronto: Principal speaker at the technical session of the Dec. 10 meeting was Ed Barker, president of Modern Tool Works, Toronto, who spoke on "Modern Machine Tools." A lengthy discussion followed his address. Approximately 120 persons attended the session.

Tri Cities: The Fifth Anniversary Meeting and Ladies Night was held at the Blackhawk Hotel, Davenport, Dec. 6.

More than 300 persons attended the plant visitation meeting held at the American Machine & Metals Company at East Moline, Ill., Nov. 1.

Immediately following the dinner George L. Magerkurth, a major league umpire, gave a coffee talk on baseball. Following his address an interesting war film was shown. Following the program, a well-conducted tour was made through the plant, showing every phase of production.

Twin States: A record-breaking attendance of 120 members and guests turned out to hear E. M. Seifert, master mechanic, assembly division, Naval Torpedo Station, Alexandria, Va., address the Nov. 10 meeting at the Masonic Temple in Springfield, Vt.

Mr. Seifert spoke on "History and Development of the Modern Torpedo," outlining the various events in the course of torpedo development and dealing with modern high speed torpedos. Also on the program was a showing of three short technical movies entitled "Navy Ashore," "High Speed Photography," and "Combat Report."

C. W. Gates, representative of Boeing Aircraft Co., was technical speaker at the Dec. 8 meeting. He spoke on "Aircraft Processing and Inspection Methods," and stressed extreme need for careful inspection of aircraft parts. A Westinghouse film, "Electromics", also was shown.

Twin Cities: H. M. Huffman, field en-

(Concluded on page 228)

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STURGIS • MICHIGAN
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FINISH

LEADS!

The Only Outstanding Improvement In Tumbling in 50 Years

THE country's leading war producers have shown that the Roto-Finish process is the major and outstanding development in mechanical finishing. Today in hundred of plants, it is making tremendous time and labor savings on a wide range of work.

Roto-Finish is highly successful on steel, brass, aluminum, stainless and nickel steels. It can be varied from a severe grinding action to the finest surface finishing. It is being used on castings up to 75 pounds . . . and on delicate, intricate small parts weighing but a fraction of an ounce — parts never before successfully finished mechanically.

Roto-Finish eliminates tedious hand grinding and polishing — production bottlenecks — and gives a more uniform finish than obtainable by hand. Users of this versatile process have cut finishing and deburring costs as much as 96%!

Ask us to process sample parts for you — free, of course — and find out exactly what Roto-Finish can do for you. Hundreds of others have been astounded!

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❶ *Tools easily honed—kept highly polished — before each shift or with tool in machine — cuts down on carbide-tool grinding.*

❷ *Keeping tools sharp saves set-up time in changing to new tools, speeds machine output and reduces work spoilage.*

❸ *Tamaloy Hones are long-lasting. Diamonds set in tungsten carbide resist wear. Carbide matrix prevents diamonds from falling out when rubbed against hard surface or edge.*

❹ *Supplied in three grades — rough, medium and fine or 100, 150 and 200 grit.*

Ask for prices and other details

TUNGSTEN ALLOY MFG. CO.

65 COLDEN STREET, NEWARK 4, N. J. formerly Circle Tip Tool Co.

gineer, Cincinnati Milling Machine Co. discussed everyday problems in cutter sharpening at the Dec. 15 meeting held at the Radisson Hotel in Minneapolis.

Western Michigan: Principal speaker at the Nov. 8 meeting held at Park Church, was Associate Prof. William W. Gilbert, Department of Metal Processing, College of Engineering, University of Michigan. He spoke on "Machinability of Metals."

His talk consisted of a report on experiments on machinability conducted at the University. He submitted numerous charts showing curves of tool life and time in relation to different speeds and depths of cut.

Windsor: An open meeting with Detroit chapter members as guests was held at Prince Edward Hotel in Windsor, Dec. 13.

A discussion on "Characteristics, Handling, and Use of Tool Steels and High Speed Steels," was led by Leonard C. Grimshaw and Ray P. Kells of Latrobe Electric Steel Co.

William J. Conley, consulting engineer for the Lincoln Electric Co. spoke on "Welding and Design" at the Nov. 15 meeting. He discussed particularly the welding of machine tool frames, jigs, and fixtures, as well as materials, supervision, inspection, reinforcements, and welding costs.

Worcester: More than 150 persons attended the regular dinner meeting held at Putnam and Thurstons Dec. 7.

After several new members were accepted, the entertainment committee presented a "Fun Nite" program.

JANUARY MEETINGS

Boston: Jan. 13, Schrafft's Restaurant. Dr. Ernest J. Abbott of Physicists Research Co. will talk on "Recent Advances in Production Measurement of Surface Roughness."

Fond du Lac: Jan. 14, Sheboygan. Subject to be "Electronics."

Montreal: Jan. 12, Windsor Hotel. E. Barker, Modern Tool Works, will speak on "Machine Tools—Trend and Design."

New Haven: Jan. 13, Duncan Hotel. P. McKenna, McKenna Metals Co., will talk on cemented carbide tools.

Rockford: Jan. 6, Faust Hotel. Hilton Ira Jones, Ph.D., managing director, Hizone Research Laboratories, will speak on "Peeps at Things to Come."

San Diego: Jan. 14, U. S. Grant Hotel. D. H. Ruhnke, Republic Steel Corp. will talk on "Alloy Steels."

Schenectady: Jan. 13. Speaker will be Burnham Finney, editor of American Machinist.

Toledo: Jan. 12, Toledo Yacht Club. H. A. Frommelt, director of research for Kearney & Trecker, will talk on development of the art of milling.

YOU'LL waste no time ON GRINDING . . .

with These Powerful THOR AIR GRINDERS

To give you top speed for peak production grinding . . . to give you precisely the type of power, light weight, and extreme stamina that make it possible, THOR Air Grinders have these advanced construction features:

1. **THOR "Air Behind the Blades" principle keeps the rotor blades out against the cylinder bushing wall, preventing dead center position and assuring *instant starting* under all operating conditions.**
2. **The solid one piece construction of the THOR rotor permits the use of deeper blade slots and wider blades. This greatly boosts the power and the rate of material removal.**
3. **The THOR Double-Acting Safety Governor acts to save time in two ways: It regulates spindle speed to the level of highest grinding efficiency for the size and type of wheel used. It prevents racing of wheels at dangerously high speeds even in event of mechanical failure of governor parts.**

You will find these top speed construction features, plus others like THOR End Exhaust, Automatic Lubrication, and Labyrinth Seal on Spindle, in a complete line of THOR Air Grinders for every industrial application. For details, write for THOR Pneumatic Catalog No. 52A.

50 Thor Air Grinders For Every Type Of Job!

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LOOK AT THE RANGE!

Number of Models	50
Wheel Capacities	1½" to 8" dia.
Speeds	3000 to 21,000 RPM
Lengths	5½" to 39"
Weights	18 oz. to 24 lbs.

Thor *Portable Pneumatic and Electric Tools*

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TUTHILL'S COOLANT PUMP LAUGHS AT CHIPS AND GRIT

TUTHILL PUMPS ARE SERVING ARMY • NAVY • AIR FORCE MERCHANT MARINE

No pump "absentee-ism" to slow up wartime production where Tuthill Model M Coolant Pumps are on the job. This internal-gear rotary pump has a built-in automatic by-pass that allows small chips and similar particles to pass through without serious injury to working parts. This exclusive safety feature assures long, dependable uninterrupted service. Sizes from 1 to 50 g.p.m. Available in stripped form for direct incorporation into the design of the machine. Write for complete catalog.

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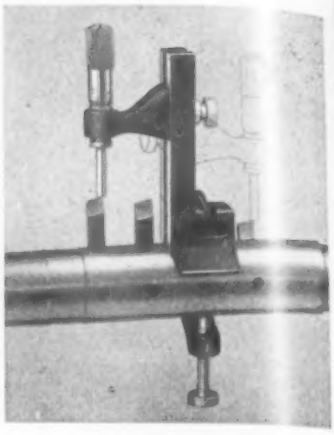
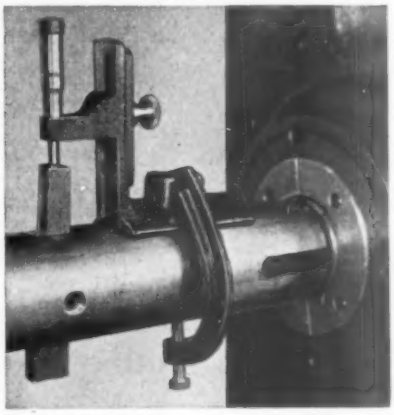
BARTELT Pedestal Micrometers

formerly called Bartelt Tool Setting Gage



MODEL "B" ↑

↓ MODEL "A"



★ These handy, practical gages will speed up boring machine work and help to produce accurate results more easily. Inexperienced hands are aided toward becoming good workmen more quickly. Available in two models, as shown. Three clamps furnished, to fit all boring bars from 1" to 5" diameter.

Write for Circulars

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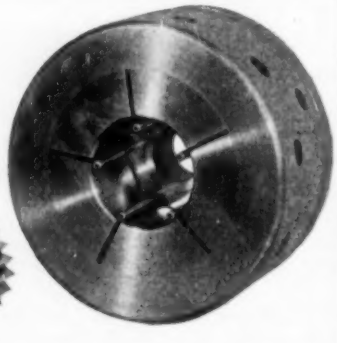
USE THE

COTTA SPEED-CHUCK



FOR INCREASED GEAR PRODUCTION AND GREATER ACCURACY . . .

For operations where gears are to be chucked for hole or face grinding, or for boring or turning, the COTTA SPEED-CHUCK offers opportunities for substantial production economies and improvement in accuracy. The gear is held precisely centered with reference to its own pitch line, thus automatically eliminating errors caused by eccentricity. There are no levers, screws, or other clamping devices to operate, as the gear is gripped firmly against the direction of rotation by hardened pitch-line pins bearing on a set of accurately ground fixed cams. COTTA SPEED-CHUCKS are made to specifications for spur, helical, and step or cluster gears. Send print of gear for quotation.

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High Speed Steel

HAND & MACHINE SCREW ★ TAPS ★

Cut Thread; Commercial and Precision Ground Thread Taps
Special Ground Thread Taps

HY-PRO Taps have Clean, Sharp, Accurate Threads for High Production

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New Bedford, Mass., U.S.A.
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DIAMONDS for Victory

Cooler dressing
Closer tolerances
Micrometer Accuracy

Because: Wing key heat dissipation and absolute diamond lock nib.

• Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.)

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The Most Complete and Up-to-the-Minute line of Diamond Tools for War Production. Send for Free Catalog and Grinders Instruction card.

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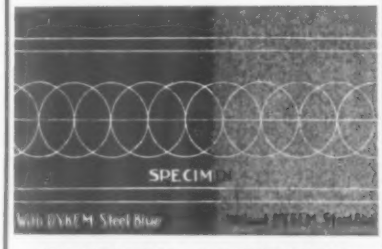
DYKEM STEEL BLUE



STOPS LOSSES
making dies & templates

simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

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CUTTING FLUIDS DESERVE YOUR SERIOUS ATTENTION

Well informed authorities have made the statement that more intelligent application of cutting fluids and better tool grinding would make possible a 30% increase in metal-working production. In these days of man-power shortage, what a challenge that statement presents!

Be honest . . . in your plant are cutting fluid problems given the attention they deserve? Are your performance records accurate? Are you aware of what better cutting fluids can do for the job? Or is your attention centered on other fields until real trouble develops which might be traceable to improper use of cutting fluids? Hundreds of metal-working plants are getting the most out of their cutting fluids by working closely with the Stuart service engineer. They know that there is no universal cutting fluid, no magic compound—but when a Stuart product is put on the job they are sure they have every cutting fluid advantage that broad engineering experience and "know how" can give them.

A REQUEST OF STUART CUSTOMERS
Containers of all types are critically scarce. We urge you to cooperate with the W.P.B. program to conserve containers by observing these four rules for handling drums.

1. Do not drop.
2. Use a little oil to avoid stripping threads in removing plugs.
3. Replace plugs carefully when drum is empty.
4. Keep drums under cover when emptied.

To be sure you have all the advantages, work with the Stuart service engineer, representing a company which has specialized in metal-working lubrication since 1865.

We invite you to write for our new free booklet, "The 577th Oil," which contains twenty-two case histories, typical examples of how Stuart engineering is solving production problems (like your own), as well as other valuable metal-working data. State your name, company and title.

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ESTABLISHED 1865
Warehouses in Principal Metal-Working Centers

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THE PASSING PARADE

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THE EVER-CHANGING SCENE IN MASS MANUFACTURING

Clyde Llewelyn, for the past two years assistant to the president of Bliss & Laughlin, Inc., recently was elected by the board of directors to the post of vice-president in charge of operations.

He has been associated with the company for 15 years, chiefly in connection with metallurgical, manufacturing and engineering contact work.

Died: **Frank P. Miller,** president of McCrosky Tool Corp., at Meadville, Pa., Dec. 11. He was 59 years old.

Mr. Miller was a McCrosky employee for 36 years. For many years he was in charge of tool engineering and design and held 75 patents in his own name. At the time of his death he was in charge of manufacturing operations.

G. J. Stegemerten, staff supervisor of industrial methods engineering for Westinghouse Electric and Mfg. Co., has been appointed expert consultant to the Secretary of War, according to a company announcement.

Mr. Stegemerten will cover special assignments from the Secretary of War's office and will study in administrative functions in connection with the various arsenals and ordnance plants operated by the War Department. A Westinghouse employee since 1909, he has held various manufacturing positions with the company.

G. Stegemerten

C. E. Shiplet

Also announced by Westinghouse is the appointment of **C. E. Shiplet** as manager of the U. S. Navy Ordnance Plant operated by the company at Louisville. Formerly plant superintendent, he succeeds **James R. Weaver** who has been made new manager of the Naval Ordnance Plant which Westinghouse is operating at Centerline, Mich., near Detroit.

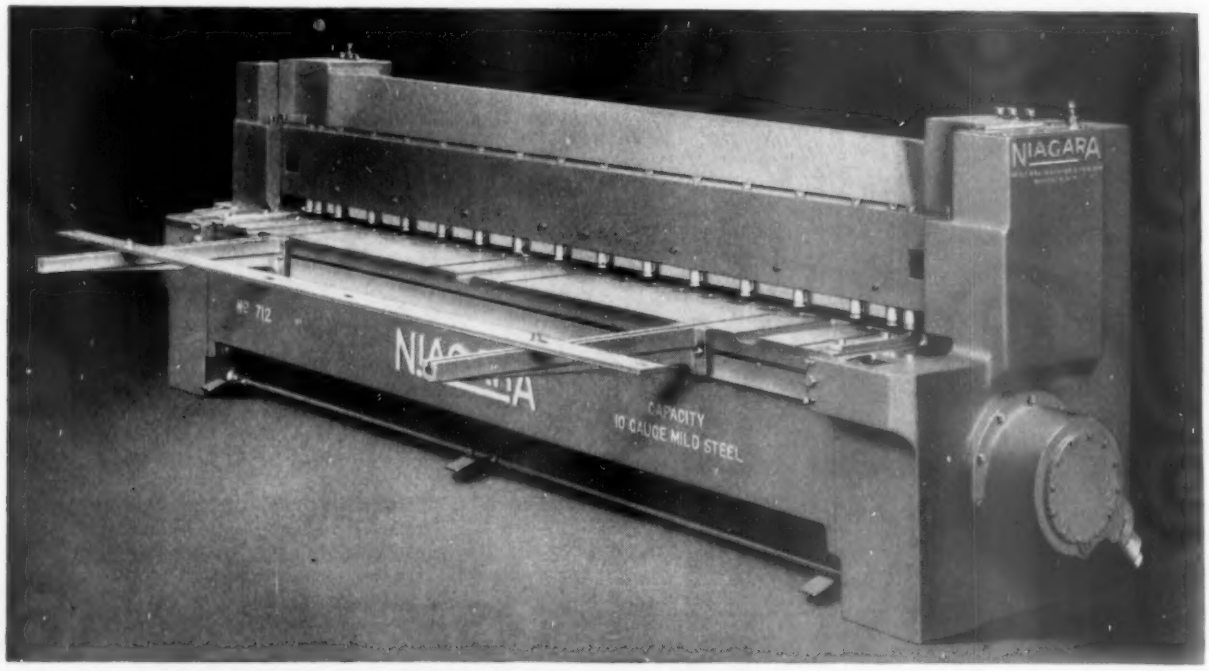
Oscar C. Willey, superintendent at the Cincinnati Planer Co. for 15 years, has been appointed tool engineer to succeed **Raymond J. Griese,** who has left the company to become works manager of the Boye & Emmes Tool Co., Cincinnati, according to a company announcement.

Mr. Willey has been associated with Cincinnati Planer since World War I. Prior to that he had worked for the R. K. LeBlond Machine Tool Co.

LeValley, McLeod, Kinkaid Co. Inc., has announced the appointment of **George N. Morceau** as manager of its tool and engineering division.

(Continued on page 234)

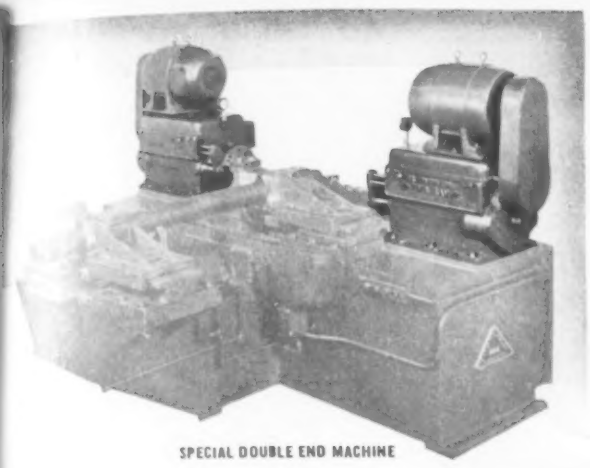
George N. Morceau



The wide and well-graduated range of Niagara Power Squaring Shears offers the most productive machines for the many requirements of war plants. They cut sheared edges and narrow strips straight to within a few thousandths of an inch. They are arranged for convenient operation to speed up squaring and trimming. Niagara Machine & Tool Works, Buffalo, N. Y. District Offices: Detroit, Cleveland, New York.

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory regrinding service by the same skilled men who grind new Niagara knives.

BUY UNITED STATES WAR BONDS AND STAMPS



SPECIAL DOUBLE END MACHINE

IT'S SIMPLE

"To Make"

A MACHINE NOW

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TWIN RAM MASTER UNIT

A COMPLETE
SELF-CONTAINED
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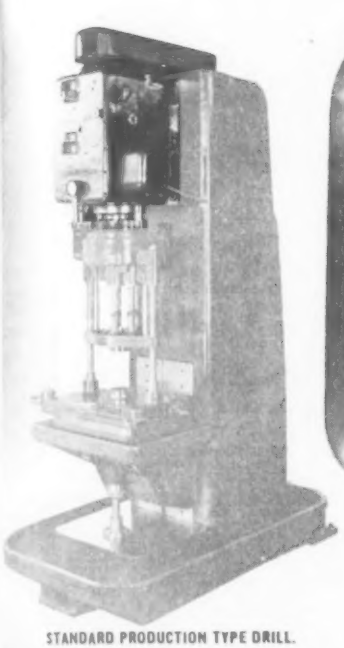
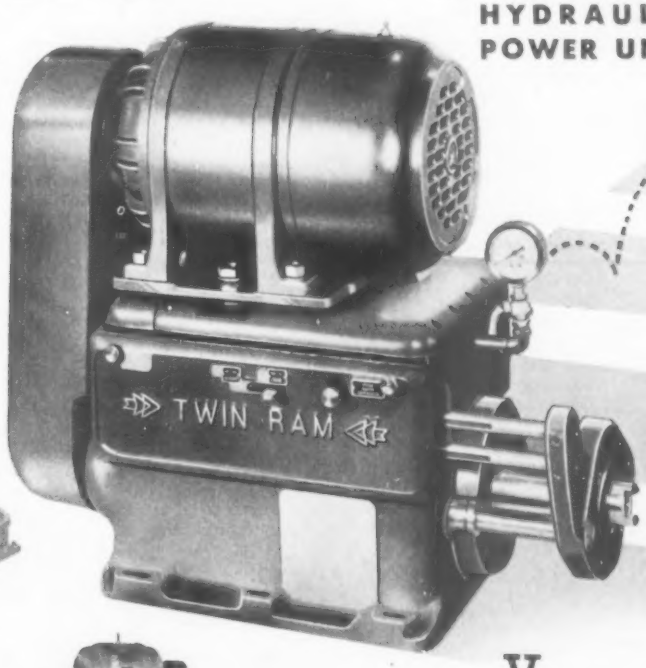
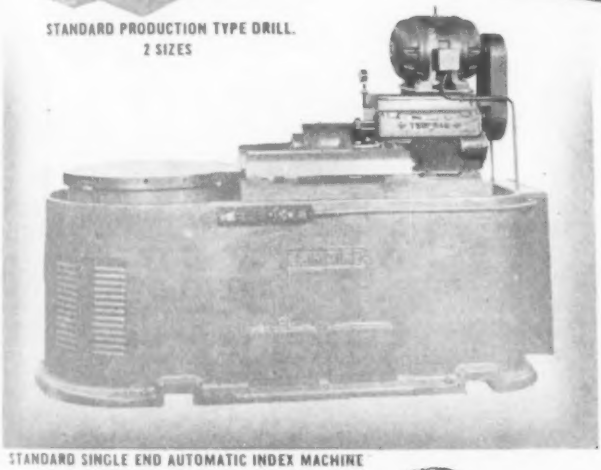


STANDARD PRODUCTION TYPE DRILL.
2 SIZES





STANDARD SINGLE END AUTOMATIC INDEX MACHINE

You can change this unit from one base to another, or rearrange your setup on the same bed, as your requirements dictate. It's practically as flexible as a motor; only pick-off gears necessary for speed changes—units provide infinite feeds. Twin Ram Unit can be used for wide range of applications—drilling (single or multiple spindle), reaming, boring, counterboring, spotfacing. Uniform pressure behind load is always in a straight line—the two rams prevent twisting action. Two sizes available. Capacity up to 2" in steel. Can be made to operate manually or automatically by remote control—for either right or left hand operation—with spindle rotation in either direction.

Send for folder giving complete information—spindle speeds and feed rates.

We invite inquiries regarding postwar plans.

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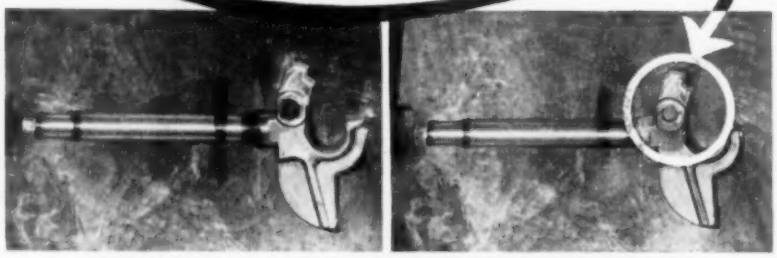
Do You Know..

THAT THE LIFE OF YOUR FORGING DIES CAN BE EXTENDED?

It's being done every day by welding with Eureka "Drawalloy" Welding Electrodes. Tons of forging dies and untold man-hours are saved in eliminating re-sinking operations.



Boss on 1200 lb. forging block replaced by welding with "Drawalloy" Electrodes.

Spalled contour on forging die rebuilt with "Drawalloy" Electrodes.

The Welding Equipment & Supply Company's Eureka "Drawalloy" Welding Electrodes have fulfilled the long felt need in the forging industry for welding electrodes that would *efficiently* rebuild, to original dimensions, the contours of forging dies that have heat checked or spalled.

This remarkable development of "Drawalloy" electrodes now makes it possible to rebuild defective forging dies so that all welded deposits closely match the characteristics of typical forging block steel. Thus the welded areas and those adjacent to them can be machined to the original dimensions of the forging die.

Eureka "Drawalloy" Welding Electrodes are available in types No. 240 and No. 340, that provide a hardness range of deposits from 240 to 380 Brinell.

When your forging dies become heat checked or spalled, don't scrap them—order Eureka "Drawalloy" Welding Electrodes today and prove to yourself how you can save both time and money with "Drawalloy".

★ *Send for our catalog listing Eureka "Drawalloy" Electrodes as well as our complete line of Tool Steel Welding Rods* ★

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WIN THE WAR • SAVE • NOW • ON TOOL STEEL WITH EUREKA TOOL STEEL ELECTRODES FIND THE SPOT

PASSING PARADE

Mr. Morceau formerly was associated with Morrison Machine Products, Inc., and Hardinge Brothers, Inc., for 17 years as engineer of designing and chief tool engineer.

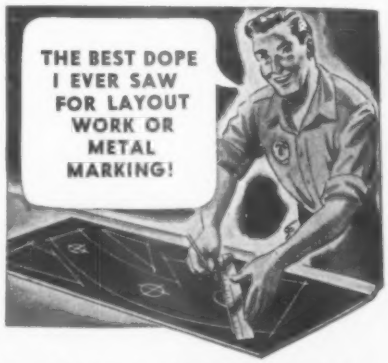
Died: **Paul C. DeWolf**, vice president of Brown and Sharpe Mfg. Co. since 1924, at Providence, R. I., Dec. 19. He was 61 years old.

Paul C. DeWolf

Mr. DeWolf had been associated with Brown and Sharpe since 1905. During his service he had held the posts of assistant superintendent of the small tool department, sales director, assistant treasurer, and vice-president. He was widely known in the machine tool field.

W. W. Galbreath, president of Alliance Porcelain Products Co. for sev-

(Continued on page 238)



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Great dope because it gives clean, clear layouts on brass, aluminum, copper, tin, stainless steel! It's oil resistant! Won't chip, crack or flake off! Great *marking dye* too—comes in four colors, blue, black, orange, red, for easy identification of metals. Some plants use to key production of day and night shifts. Comes in handy 8 oz. bench-type brush-in cans. Also pints, quarts, gallons. Order today!

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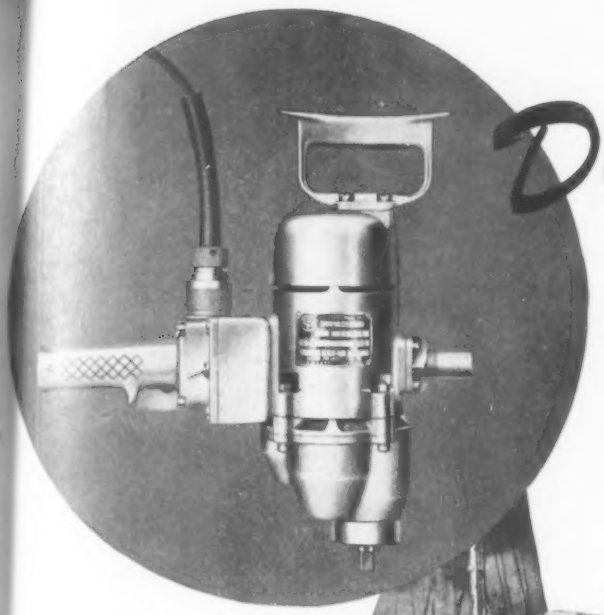

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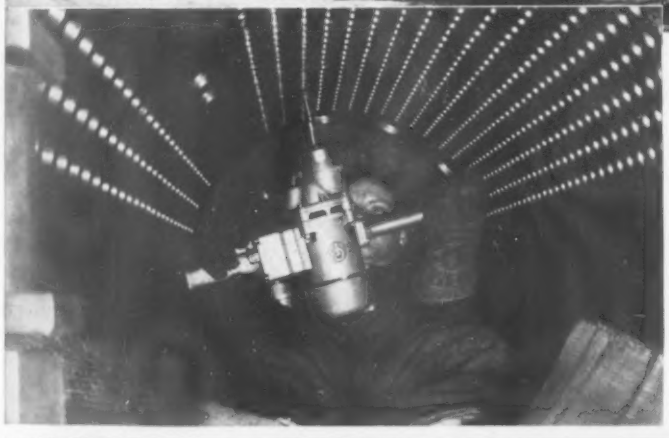
ROLLING TUBE ENDS IN D.E. BOILERS

(Official U. S. Navy Photograph)



CP No. 939 Electric Reversible Flue Roller, while designed especially for builders of D. E. vessels, is ideal for rolling tube ends in any small boiler drum. Rolls 1″ or 1½″ tubes. Only 14½″ overall. Weighs only 17½ pounds. Write for complete data.

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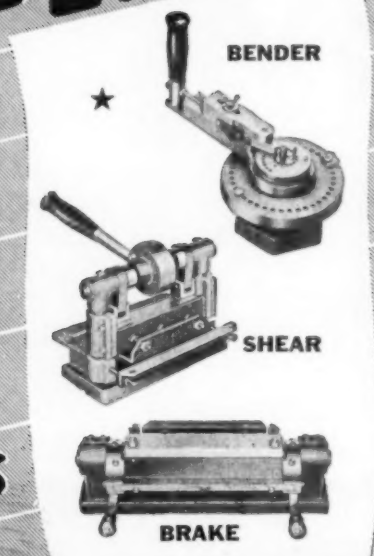

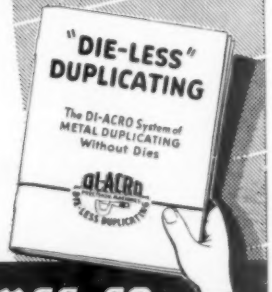

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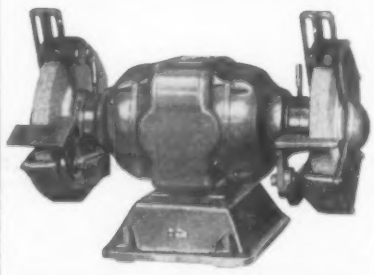

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Announcing THE NEW NUMBER 2 *Filtaire* PORTABLE DUST COLLECTOR

The NEW No. 2 Filtaire Portable Dust Collector has design features that offer outstanding advantages to manufacturers doing dry grinding, polishing, and other dust-creating jobs. This new unit has the fan at the ***front, two*** replaceable Dustop filters at the top, and the motor ***completely enclosed*** behind a baffle plate at the rear.

The new Filtaire can be used anywhere that a 110-volt outlet is available—it cleans 2000 cu. ft. of air a minute—it ***recirculates*** warm air within the shop—it is adjustable for all types of machines—it is sturdy, light weight and ***portable!***

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Please send me complete information on the new No. 2 Filtaire Portable Dust Collector

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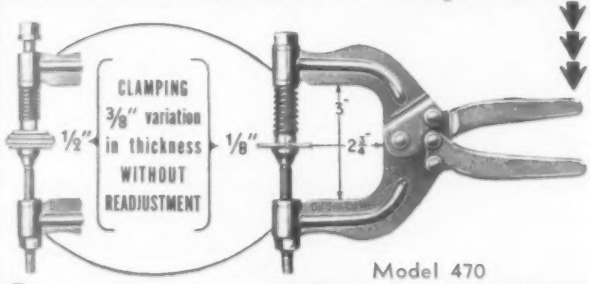
BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

Now You Can Clamp Dimensional Variations Without Readjustment



Model 470

DE-STA-CO *Portable* **CLAMP**

With Pressure-Matic Feature

"Pressure-Matic" . . . a De-Sta-Co feature, provides up to 3/8" automatic adjustment of clamping thickness. Thumb screw and lock nut gap adjustment. Used in riveting, drilling, welding, gluing, sawing, routing and assembly operations. Swivel foot provides angular clamping. Spindles copper-plated against welding spatter. Quicker, easier than "C" clamps. Smaller sizes available.

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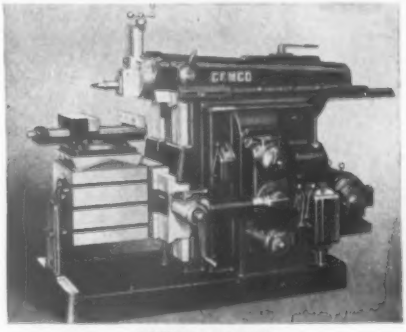

UNIVERSAL TYPE

PLAIN TYPE A fast utility machine for a wide variety of the average shop work and for training purposes in industrial schools

PRODUCTION TYPE Massively constructed with a large table to handle medium heavy work on a peak production basis with high limits of accuracy.

UNIVERSAL TYPE Ideal for tool and die work, experimental laboratories and model shops or where angular work set-ups are required.

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Immediate Deliveries on Firm Orders!

GENERAL ENGINEERING & MFG. CO.

ST. LOUIS 4, MISSOURI

Manufacturers of Precision Equipment SINCE 1917

eral years, has been named executive vice-president of the Pressed Metal Institute.

Mr. Galbreath is well known in the steel and stamped metal industries. In his new post we will give special attention to institute post-war problems and planning. Headquarters of the Institute have been transferred from New York to Cleveland in order to facilitate service to members and to expedite the work of research committees.

John C. Redmond has been appointed research engineer and chief analytical chemist for Kennametal, Inc., according to a company announcement. Prior to his association with Kennametal he was connected with the Youngstown Sheet and Tube Company where he was engaged in chemical analysis, research and process development. He is a graduate of Hamilton College and George Washington University.

William Hyndman, III, has joined the engineering sales staff of Atlas Tool & Designing Co. and Atlas Metal Stamping Co. Prior to taking his present position, he was associated with the Coplay Cement Manufacturing Co. of Philadelphia.

The Ohio Crankshaft Company, Cleveland, announces the appointment of **Tinkham Veale II** as production manager of the TOCCO Induction Process Division.

Mr. Veale, who will be in charge of all phases of production of the Division, joined the company early in 1942 as assistant to the president in charge of production control records. Formerly he was associated with The Reliance Electric and Engineering Company of Cleveland as sales-engineering representative. Prior to that, he was associated with Avery Engineering Co.

H. S. Tweedy has been appointed manager of the field service division of Detrex Corporation, according to a company announcement. Prior to his appointment, he was inspector of production in all Detrex plants, and served four years as a design engineer.

H. K. Porter Co., Inc., announces that **Victor P. Shaffer** has been named engineer in charge of design for the process division. His duties also will include supervision of an expanded program of development and research.

Prior to his present appointment, Mr. Shaffer had been associated for ten years with design, development and plant layout for the Calco Chemical Division of American Cyanamid Corp.

E. C. Hawkins has been appointed sales manager of the John S. Barnes Corporation's new eastern sales office in New York City. He formerly was chief engineer of the LeMaire Tool and Manufacturing Co., Detroit.

John DiEugenio, formerly plant superintendent for General Elevator Co., now is factory representative for five machine tool companies, with headquarters at Avondale, Arizona. He is representing Logansport Machine Corp., McCrosky Tool Corp., Weldon Tool Co., John Bath & Co., and Everede Tool Co. Prior to his association with General Elevator Co., he was plant superintendent for Clay Oil Burner Corp.

Thomas H. Glaser, tool engineer with more than 20 years' experience in the metal-working field, has been appointed installation and tooling consultant for Gray-Mills Co. His activities will be centered particularly in the field of application and consultation on fluid cooler installations.

Allegheny Ludlum Steel Corp. announces the appointment of **E. L. Huff** as chief engineer of all plants of the corporation. Mr. Huff formerly was electrical engineer at Allegheny's Breckenridge plant.

Ward M. Canaday has been elected president of Willys-Overland, according to an announcement by the board of directors. An employee of the company since 1916, he became an assistant to the late John N. Willys. He has had experience in sales, production and management of the motor industry. In 1918 he served on the War Industries Board, and in 1933 as director of the Federal Housing Administration.

Norton Company announces that **William R. Moore** has been made a

(Continued on page 240)

C/R MALLETS AND HAMMERS

permit forceful effective blows without battering, scarring or marring. They protect fine finishes, delicate insulation, hardened parts and costly machinery. They far outlast other mallets, hold a true striking face and, because they absorb recoil, they are less fatiguing on continuous use operations (as pounding in winding, assembly work, etc.). Speed production—reduce spoilage. All sizes. Weighted or unweighted. Hammers take replaceable insert faces.

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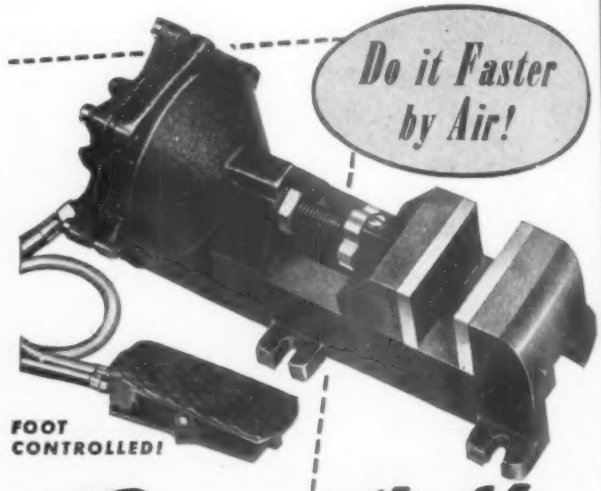
Replacement insert faces for C/R Hammers sold by leading supply houses.



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Made of finest nickel steel, heat treated, uses a H.S. Steel or solid Tungsten bit. Bit cuts ahead of the bar and allows boring of a hole right up to the shoulder. Designed for rigidity and adaptability to all uses. Bars for lathe boring range from 7/32" to 3½". From 7/32" to ¾" with precision ground shanks for jig boring.

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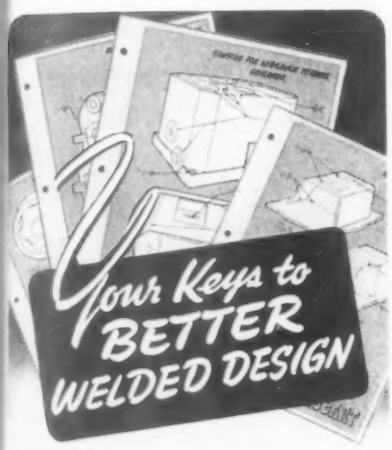

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MACHINE WORKS, INC.
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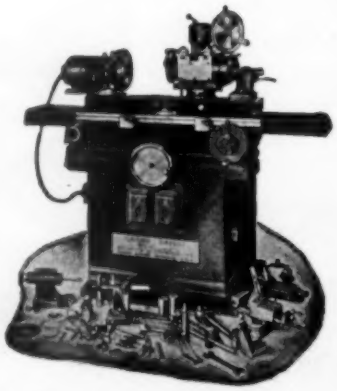
NO. 6
UNIVERSAL CUTTER
AND TOOL GRINDER



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He has been connected with the activities of Grinding Wheel Manufacturers Association for many years and is a director of the Abrasive Grain Association.

Kenneth Hall has been appointed factory representative for the Snyder Tool & Engineering Company, Detroit, for the midwestern territory covering Indiana, Illinois and Wisconsin, according to a company announcement.

CLASSIFIED ADVERTISING

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2842 W. Grand Blvd. Detroit, Mich.

SITUATIONS AVAILABLE

WANTED — MANUFACTURER'S REPRESENTATIVE to handle well-known line of precision gages in New England. Line is well established in territory and producing income in five figures. High type, established representative handling small tools or kindred lines who desires highly profitable major line is desired. Interview will be arranged. Write, giving full details of present connection and qualifications, to Box 790, TOOL ENGINEER.

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Well known Midwest special machine tool manufacturer, in business over 50 years, has opening for a designer with ability and imagination. Excellent post-war future. Address P.O. Box No. 414, Beloit, Wisconsin.

Required at once: One Sr. Tool Designer and two Jr. Tool Designers. Familiar with jig and die designing. Please state age, experience, education, draft, and marital status, including number of children. If not engaged in essential war work, mail application to Bechtel-McCone-Parsons Corporation, Birmingham 1, Alabama, Attention of Employment Office.

Engineer
Mechanical research, to investigate mechanisms, tools and processes in established industrial plant. Good understanding of working properties of metals essential. Man of sound knowledge and experience required. Write fully. Availability statement necessary. Box 789, TOOL ENGINEER.

WANTED
Machine Designers
and
Tool Designers
Men wanted for war work today who will stay with company in post-war period. Pleasant midwestern town of 11,000 population; low living costs; very modern plant. Give age, draft status, experience, references, availability, and salary expected.
THE MONARCH MACHINE TOOL COMPANY
Sidney, Ohio

WANTED: Representative to sell Automatic Safety Clutches. An ideal product to handle with other Power Transmission Lines. Commission basis. Box 793, TOOL ENGINEER.

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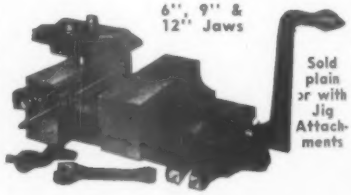
PRECISION DIE SETS

HANDLING A WIDE VARIETY OF WORK —



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Handles wide variety in two respects: first, its various sizes suit practically every type of machine from heavy planer and shaper work, through milling, radial and grinding, to light drill press work; second, its special jaws, stops, guides, etc., suit it to holding innumerable shapes for single or repeat-operation work, with accurate positioning due to flush, parallel and square construction. A great time-saver in taking the place of special jigs and fixtures.

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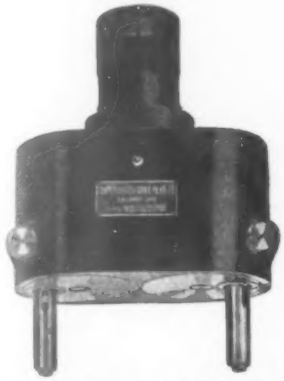

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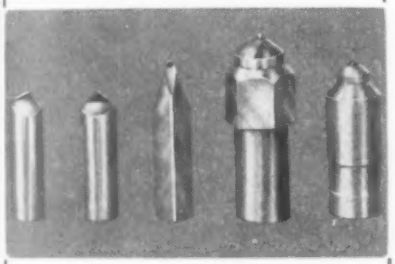

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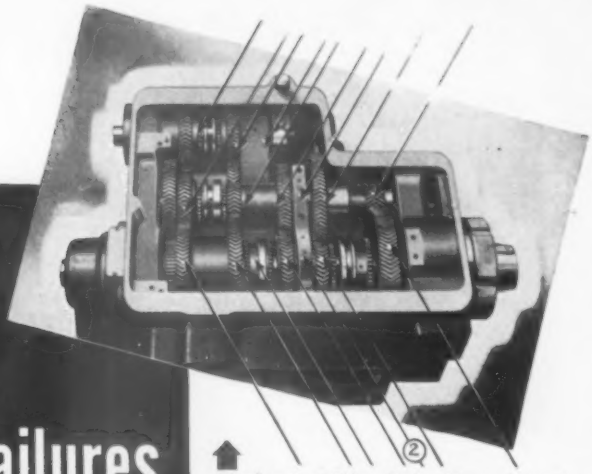

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. . . with bushings and center bearings of wear-resisting Ampco Metal . . .

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- ★No annealing
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Immediate Shipment. Stock sizes No. 4 to 1½", 2, 3, 4 flutes. 30 day free trial.

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FISHER BENDER

This hand-operated bender is made of the best quality malleable iron castings with hardened steel bending blade.

It will bend up to
½" square or round iron,
2" x ½" channel iron,
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WEIGHT: 40 POUNDS

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MASTER PLANER GAGE

THE TOOL OF 101 USES

The design and precision construction of the Lufkin Master Planer Gage make it not only a better Planer Gage, but make it available for scores of jobs for which ordinary gages are unsuited. This tool may be used with gage blocks to set up work on a surface plate; with a sine bar to set cutting tools; with an Indicator for transferring measurements and in many other practical ways. You really get more than a Planer Gage when you buy this Lufkin tool. Write for free tool catalog.

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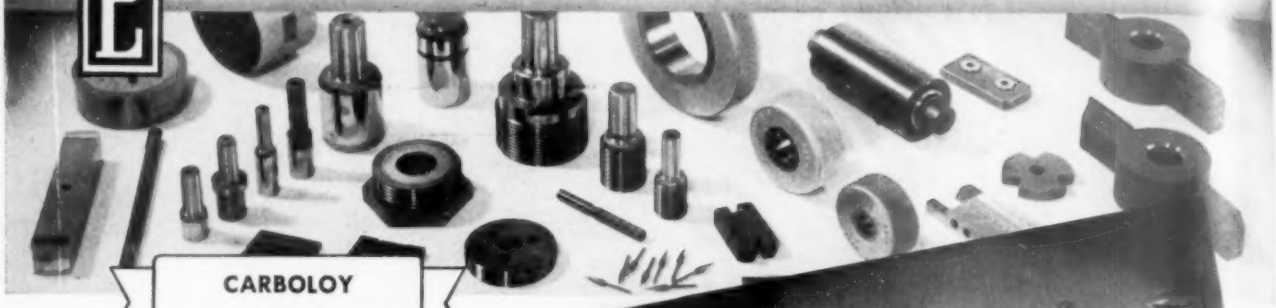

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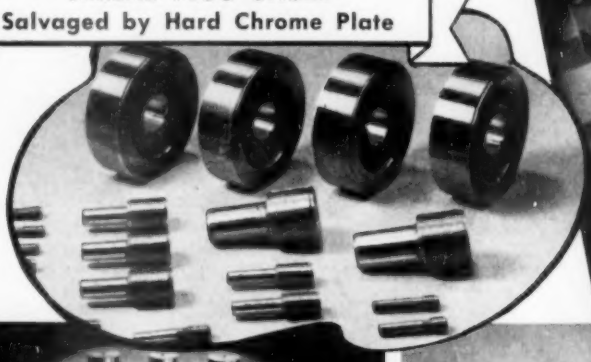

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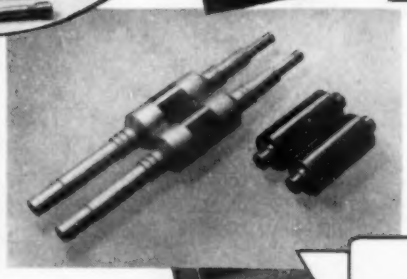

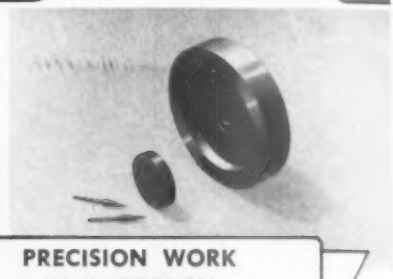

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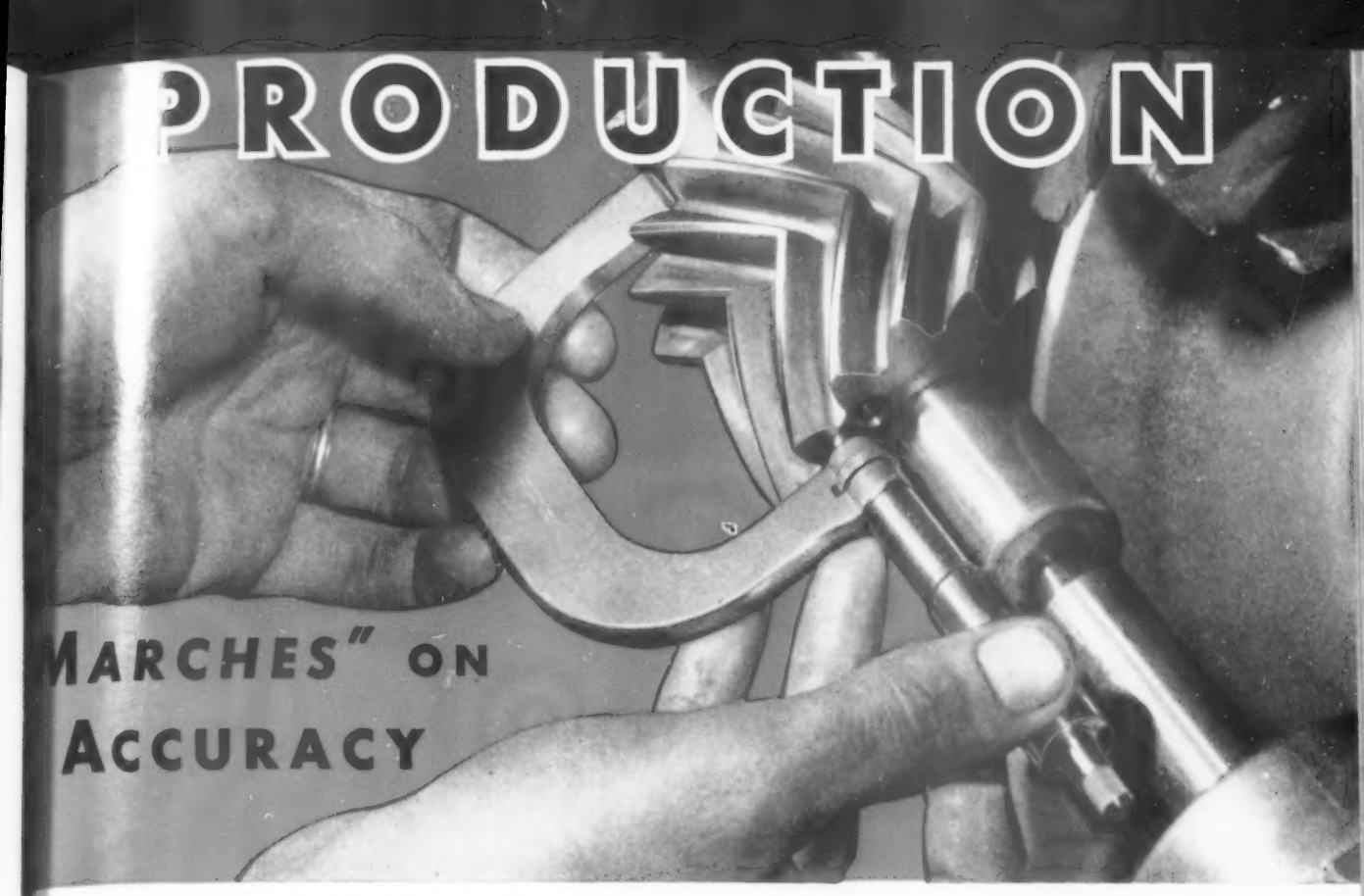
PRODUCTION



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